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COMMERCIAL GUIDE TO THE FOREST ECONOMIC PRODUCTS OF INDIA

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INTRODUCTION.

THE need of a hand-book on the Forest Resources of India was pointed out in the Indian Section of the Report (page 24) submitted by the Committee of the Franco-British Exhibition of 1908, with the result that the Government of India, after due consideration, decided upon having such a work prepared.

The primary object of this publication is to illustrate for the benefit of firms and persons interested in such matters, the uses, value and possible yield of the various Forest Products in the different Provinces of British India, and also to indicate the official designations and addresses of the Officers to whom enquiries should be directed concerning the purchase of such products. Further, as the publication is intended for wide distribution at Exhibitions and to the Commercial Public, it has been found necessary to keep the work as concise as possible and only deal with the most valuable timbers and minor products found in the State Forests.

The subject has been dealt with under three heads. The first chapter is a short *resumé* of the distribution and classification of the many types of forests found in British India, together with a note as to the financial working of this enormous State property. Chapter II deals with eighty of the more common timber trees of India and Burma, briefly explaining the distribution, quality and uses of the timber, its approximate value and yield in various localities and to whom enquiries should be directed for further information on the subject. Chapter III deals with the minor products such as cutch, gums, fibres, resins, tan and dye-products, oil-seeds and a variety of others. It has not been possible to deal with this subject further than touch on a few of the most important products and indicate the localities from which they are procurable.

The scientific names of the trees have been used in the context, but in this respect, where possible, either the vernacular or English name has been either added or substituted, so as to avoid confusion in the minds of persons not accustomed to the use of scientific names. An index of vernacular and English names, as also one of scientific names, is added at the end of the book.

As regards illustrations, want of space has limited them to a map showing the general distribution of the forests, and in the body of the work to a few photographs illustrating some of the better known species.

The data given in the body of the book have been collected from a variety of sources, the most important of which are the Ledger Files in the office of the Imperial Forest Economist, the Administration Reports of the Inspector General of Forests and those of the various Provinces. Official Reports by Conservators and Divisional Officers, and from experience gained by the writer during his service. A very considerable quantity of information, especially as to outturn and prices in the various Circles and Divisions, has also been supplied unofficially by members of the Forest Department and to them are due the writer's best thanks for the personal trouble they have taken in the matter. To give a complete list of the names of these officers is not possible and the most that can be done is to acknowledge the help given by Messrs. Hart, Bell, Jackson, Rogers, Clutterbuck, Carter, Peake, Wilkins, Foulkes, Farrington, Mayes, Thomson, Arbuthnot, Gibson, Walker, Aitchison and Courthope. Acknowledgments are also due to Mr. Browns of the Malabar Saw Mills, Kallai, Calicut and Mr. Coehlo of Karwar, Kanara, for information supplied as to yield and prices in those localities.

As regards the uses to which timber and minor products are put, Gamble's Manual of Indian Timbers, Troup's Indian Woods and their Uses, and Watt's Commercial Products of India have been freely consulted. Under this head there is little that is new except the addition of such information as has been collected since the publication of those standard works.

CONTENTS.

INTRODUCTION i

CHAPTER I.

DISTRIBUTION AND DESCRIPTION OF THE STATE FORESTS.

GENERAL.

PAGE

Commencement of Forestry in India 1

DISTRIBUTION AND AREAS.

Burma area 2
Northern area 2
Chittagong and Arakan area 2
Central area 2
Western area 2
Eastern area 2
Area of Forests in 1908-09 3

TYPES OF FORESTS.

General 4
Deodar forests 4
Other Conifer forests 4
Sissoo and Khair forests 5
Evergreens of Assam and Arakan 5
Sal forests 5
Babul forests 5
Deciduous forests of the dry zone 6
Forests of the Western Ghats 6
Moist deciduous forests 6
Evergreen forests of Malabar 6
Teak forests of Burma 7
"In" do. do. 7
Cutch do. do. 7
Hill do. do. 7
Andaman forests 7
Tidal forests 7

PAGE

OUTTURN AND VALUE OF TIMBER, FUEL, AND MINOR PRODUCTS

Outturn 7
Revenue 8

CHAPTER II.

MAJOR PRODUCTS.

General 8
Important Major Products 8
Annual outturn of Major Products 9

IMPORTANT SPECIES DEALT WITH

1. *Abies Webbiana*, Lindl and *Abies Pindrow*, Spach. (The Himalayan Silver Firs) 9
2. *Acacia arabica*, Willd. (Babul) 11
3. ,, *Catechu*, Willd. (Khair) 12
4. *Adina cordifolia*, Hook. (Haldu) 13
5. *Albizzia Lebbek*, Benth. (Siris) 14
6. ,, *odoratissima*, Benth. (Kala Siris) 16
7. *Anogeissus latifolia*, Wall. (Dhaura or Bakli) 16
8. *Artocarpus Chaplasha*, Roxb. (Chaplash) 21
9. ,, *integrifolia*, Linn. f. (The Jack tree) 22
10. ,, *Lakoocha*, Roxb. (Dhau) 23
11. *Barringtonia acutangula*, Gaertn. (Ijal) 23
12. *Bassia latifolia*, Roxb. (Mohwa) 24
13. *Bischofia javanica*, Blume. (The Uriam tree of Assam) . . . 25
14. *Bœhmeria rugulosa*, Wedd. (Geti or Dar) 26
15. *Bombax insigne*, Wall. (The False Semul or Didu) 27
16. ,, *malabaricum*, DC. (The Semul or Indian Cotton tree) . . 28
17. *Boswellia serrata*, Roxb. (Salai) 29
18. *Butea frondosa*, Roxb. (Palás or Dhák) 30
19. *Calophyllum Inophyllum*, Linn. (Wuma) 31
20. ,, *tomentosum*, Wight. (The Poon-spar tree) . . . 31
21. *Carallia integerrima*, DC. (The Carallia tree) 32
22. *Careya arborea*, Roxb. (Kumbi or Kumbia) 34
23. *Cassia Fistula*, Linn. (The Indian Laburnum) 34
24. *Castanopsis Hystrix*, A. DC. (The Indian Chestnut) 35
25. *Casuarina equisetifolia*, Forst. (The Casuarina tree) 36
26. *Cedrela Toona*, Roxb. (The Toon or Red Cedar) 37
27. *Cedrus Libani*, Barrel, var. *Deodara*, Loudon. (The Himalayan Cedar) 38

PAGE.

28. *Chloroxylon Swietenia*, DC. (Satin Wood) 41
29. *Cupressus torulosa*, Don. (The Himalayan Cypress) 42
30. *Dalbergia latifolia*, Roxb. (The Blackwood or Rosewood of Southern India) 43
31. *Dalbergia Sissoo*, Roxb. (The Shisham) 45
32. *Diospyros Ebenum*, Kœnig. (Ebony) 46
33. ,, *Kurzii*, Hiern. (Andaman Marble-wood or Zebra-wood) 47
34. ,, *Melanoxylon*, Roxb. (Tendu) 47
35. *Dipterocarpus tuberculatus*, Roxb. (The "Eng" or "In" tree of Burma) 48
36. *Dipterocarpus turbinatus*, Gaertn. f. (The Gurjan-oil tree) . . 49
37. *Erythrina suberosa*, Roxb. (Pangra, Dauldhak or Madara) . . 50
38. *Eugenia Jambolana*, Lam. (The Jaman or Black-plum tree) . . 50
39. *Ficus bengalensis*, Linn. (The Banyan tree) 51
40. *Gmelina arborea*, Roxb. (Shivani or Kumhar) 52
41. *Grewia tiliæfolia*, Vahl. (Dhamni or Dhamin) 53
42. *Hardwickia binata*, Roxb. (Anjan) 54
43. *Heritiera minor*, Roxb. (Sundri) 56
44. *Holarrhena antidysenterica*, Wall. (Kura or Dhudi) 57
45. *Holoptelea integrifolia*, Planch. 57
46. *Homalium tomentosum*, Benth. (The Myaukchaw tree of Burma or Moulmein Lancewood) 58
47. *Hopea odorata*, Roxb. (The Thingan tree of Burma or Rimda tree of the Andamans) 59
48. *Hopea parviflora*, Bedd. (The Irumbogam tree of Malabar) . . 60
49. *Juglans regia*, Linn. (The Indian Walnut) 61
50. *Lagerströmia Flos-Reginæ*, Retz. (The Taman tree of India or Pyinma tree of Burma) 62
51. *Lagerströmia lanceolata*, Wall. (The Nana or Benteak of the West Coast 64
52. *Lagerströmia parviflora*, Roxb. (Dhaura or Bondarah) . . . 65
53. *Mangifera indica*, Linn. (The Mango tree) 66
54. *Melia indica*, Brandis. (The Neem tree) 67
55. *Mesua ferrea*, Linn. (Nahor) 68
56. *Mimusops Elengi*, Linn. 69
57. *Odina Wodier*, Roxb. (Jhingan or Mohin) 70
58. *Ougeinia dalbergioides*, Benth. (Tinnas, Tewas or Sandan) . . 71
59. *Picea Morinda*, Link. (The Himalayan Spruce) 74
60. *Pinus excelsa*, Wall. (The Blue Pine) 75
61. ,, *longifolia*, Roxb. (The Long-needled Pine or Chir) . . 77
62. *Podocarpus neriifolia*, Don. 79
63. *Populus euphratica*, Olivier. (The Bahan tree of Sind and the Punjab) 80
64. *Pterocarpus dalbergioides*, Roxb. (The Andaman Padauk or Redwood) 81

PAGE.

65. *Pterocarpus macrocarpus*, Kurz. (The Burma Padauk) 82
66. „ *Marsupium*, Roxb. (Honne Bijasal or the Gum-kino tree) 84
67. „ *santalinus*, Linn. f. (The Red Sanders) . 86
68. *Quercus dilatata*, Lindl. (The Moru Oak) 87
69. „ *incana*, Roxb. (The Ban Oak) 88
70. *Santalum album*, Linn. (The Sandal-wood tree) . . . 89
71. *Schleichera trijuga*, Willd. (Kosum) 92
72. *Shorea robusta*, Gaertn. f. (Sal) 93
73. *Soymida febrifuga*, Adr. Juss. (The Indian Red-wood) . . . 97
74. *Stephegyne parvifolia*, Korth. 98
75. *Taxus baccata*, Linn. (The Yew) 99
76. *Tectona grandis*, Linn. f. (The Teak tree) 100
77. *Terminalia paniculata*, W. and A. (Kindal or Hongal) . . . 103
78. „ *tomentosa*, W. and A. (Sain, Asna, Ain, Sadia or Mutti) 104
79. *Vateria indica*, Linn. (The Piney Tallow tree) 107
80. *Xylia dolabriformis*, Benth. (The Pyinkado or the Iron-wood tree of Burma or Jamba tree of Southern India) 107

CHAPTER III.

MINOR FOREST PRODUCTS.

1. FIBRES AND FLOSSES.

(*a*) Fibres from Leaves—
Screw Pine fibre. 111
The Sago Palm fibre 112
Agave or Sisal fibre 112
Plantain fibre 113
Wild Date and Palmyra Palms 113
Golpatta 113
(*b*) Stem and Bast-fibres—
Sterculiaceæ 114
Leguminosæ 114
Tiliaceæ 115
Urticaceæ 115
Asclepiadaceæ 116
Various other Bast fibres 116
(*c*) Flosses—
Bombax malabaricum 117
Cochlospermum gossypium 117
Calotropis spp. 117
Other floss-producing trees, shrubs and climbers 117

PAGE.

2. GRASSES (OTHER THAN OIL-GRASSES).

(*a*) **Fibre Grasses—**

- **Munj grass** 117
- **Bhabar or Sabai grass** 118

(*b*) **Thatching Grasses** 118

(*c*) **Grazing and Fodder Grasses—**

- **Grazing** 119
- **Fodder grasses** 119

(*d*) **Other Fibrous Products—**

- **Khas-khas** 120
- **Korai** 120
- **Reeds** 120

3. DISTILLATION PRODUCTS.

(*a*) Grass-Oils—

- Rosha grass oil 120
- Lemon grass oil 121

(*b*) Wood-Oils—

- Sandal-wood oil 122
- Agar-agar oil 122
- Other wood oils 122

(*c*) Miscellaneous Products of Distillation—

- Cutch and Kath 123
- Charcoal 124
- Camphor 124
- Cinnamon-oil 124
- Mohwa liquor 124

4. OIL-SEEDS.

Oil-Seeds of—

- *Bassia latifolia* 125
- „ *butyracea* 126
- *Schleichera trijuga* 126
- *Mesua ferrea* 127
- *Pongamia glabra* 127
- *Celastrus paniculata* 127
- *Prunus eburnea* 128
- *Diospyros montana* 128

5. TANS AND DYES.

(*a*) **Tan-Barks from—**

- *Acacia arabica* 129

PAGE.

Cassia auriculata 131
,, *Fistula* 131
Mangrove 132
Other tan-barks 132
(*b*) Tan-Leaves 132
(*c*) Tan-Fruits—
Myrabolams 133
Babul pods 134
Emblic and Beleric myrabolams 134
Divi-divi pods 134
Goth-bor 134
(*d*) Wood, Bark and Root-Dyes—
Wood-dyes 134
Root ,, ... 135
Bark ,, ... 135
(*e*) Dye Flowers—
Kamela powder 135
Surgi flowers 135
Other dye flowers 135

6. GUMS, RESINS AND OLEO-RESINS.

(*a*) Gums and Gum-Resins—
Gum arabic 136
Babul gum 136
Gum kino 137
Katira gum 137
Mohin gum 137
Bengal kino 137
Dhaura gum 137
Moringa gum 137
Indian Red-wood gum 138
Chironji gum 138
Gum of *Gardenia* spp. 138
Salai or Gugal gum 138
(*b*) Resins other than Pine-Resin—
Indian Copal or Piney resin or White dammar 138
Hopea odorata resin or Rock dammar 139
Pwenyet dammar 139
(*c*) Pine-Resin—
Rosin or Colophony and Turpentine 139
(*d*) Oleo-Resins—
Gurjan oil 140
" In " oil 140
Thitsi oil 140

PAGE.

7. RUBBER.

Ficus elastica rubber 141
Other rubber-yielding plants 141
Para and other exotic rubber plants 141

8. DRUGS AND SPICES.

(*a*) Root Drugs—
  Podophyllum 142
  Saussurea Lappa (the Khut plant) 143
  Aconite spp. 143
  Other root drugs 144
(*b*) Stem and Bark Drugs—
  Cassia bark 144
  Other barks 144
(*c*) Fruit and Seed Drugs and Spices—
  Nux-Vomica seed 144
  Cardamoms 145
  Ritha or Soap-nut 146
  Pepper 146
  Shigakai or Sheakoy 146
  Bael fruit 146
  Cassia Fistula pods. 147
  Other drugs 147

9. EDIBLE PRODUCTS.

Edible fruits, leaves and roots 147
" Grass-seeds 148

10. BAMBOOS AND CANES.

(*a*) Bamboos—
  Dendrocalamus strictus 148
  Other varieties of bamboos 148
(*b*) Canes 149

11. ANIMAL PRODUCTS.

(*a*) Lac 152
(*b*) Wax and Honey 153
(*c*) Other Animal Products 154

12. MISCELLANEOUS MINOR FOREST PRODUCTS.

Pathi leaves 155
Talipot palms 155
Cigarrette leaves 155
Mineral Products 155
Other Minor Products 155

Commercial Guide to the Forest Economic Products of India.

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CHAPTER I.

DISTRIBUTION AND DESCRIPTION OF STATE FORESTS.

GENERAL.

Commencement of Forestry in India.

The first attempts made in India to protect the forests from destruction were commenced nearly a century ago in Madras, while the first serious attempts to increase the area under teak, by forming plantations, were made some 80 years ago, by a Civilian of the name of Conolly, who started the famous Nilambur plantations on the Malabar Coast. It was not, however, until 1856 that Lord Dalhousie laid down a definite policy with the view of affording more widespread protection to the valuable forests both in India and Burma, and it is due to his wise forethought that these valuable forests have in a great measure been saved from ultimate destruction.

DISTRIBUTION AND AREAS.

The area of State Forests now under complete or partial protection amounts in round figures to 240,000 square miles, or approximately one-fourth of the whole of British India. The distribution of these areas over the whole country is by no means regular, so that in certain localities owing to the abundance of wood material many timbers of good quality are at present a drug in the market, while in others, owing to the scarcity of forest growth, timbers of no great strength or durability have obtained a wholly disproportionate value in the eyes of the local population.

Burma area. Attention is drawn to the map at the end of the book on which the forests are shown, and from which it will be seen that the largest and most valuable forests owned by the State are to be found in Burma, and that their distribution is fairly even all over that Province.

Northern area. In India proper a more or less continuous belt of forests occurs along the Himalayas and Sub-Himalayan tract, extending from the Kashmir boundary in the north-west and running through the Punjab and United Provinces to Gorakhpur, on the Nepal boundary. This belt of forests continues on through Nepal, and again enters British territory near Darjeeling, thence forming a chain of forest blocks extending to the extreme nort-east of Eastern Bengal and Assam in the Lakhimpur Division and southwards to the Chittagong boundary.

South of the Himalayan belt, with the exception of some limited areas along the Indus, near Multan and in Sind, no forests of any great extent are found in Rajputana, Northern Guzarat, many parts of the Central India Agency and over the highly cultivated plains of the Ganges.

Chittagong and Arakan area. Along the Chittagong coast, extending to the north through the Garo and Khasia Hills to the eastern limit of the northern area and extending southward and eastwards into Arakan, there exists a string of forest blocks often of great size.

Central area. It is not until reaching the Central Provinces, that large forest areas again occur. This central belt commences on the west in the Surat Dangs and, running through the Satpuras and Central Provinces, extends southwards into the Deccan and eastwards into Bengal, terminating in the Sunderbans forests, south of Calcutta.

Western area. The third forest zone occurs on the West Coast, starting in the north of the Thana district of the Bombay Presidency, and forming a chain of forest blocks along the Western Ghats often stretching considerable distances inland, and running southwards through Kanara, Malabar, the Nilgiris and Annamalais to the extreme south of India.

Eastern area. The fourth area is on the East Coast, commencing in the north with the forests of Ganjam and Vizagapatam, stretching inland to Kurnool and southwards through Nellore and Salem and then amalgamating with the West Coast area in Southern Madras.

Area of Forests in 1908-09.

The distribution of the forests, in 1908-09, in the various Provinces was as follows :—

Province or Presidency.	Area of Reserved forests.	Area of Protected, Unclassed, and Leased forests.	REMARKS.
	Sq. miles.	Sq. miles.	
Bengal . . .	4,240	3,392	
Eastern Bengal and Assam.	6,556	(*a*) 22,695	(*a*) Unclassed forests.
United Provinces .	3,934	(*b*) 9,224	(*b*) 42 square miles Unclassed. 157 square miles Leased and the remainder Protected forests.
Punjab and North-West Frontier.	2,170	(*c*) 2,211	(*c*) 1,722 square miles Unclassed and 369 square miles Leased, the rest Protected forests.
Central Provinces .	(*d*) 22,001	.	(*d*) Of which a portion is Protected forest.
Madras . . .	18,549	(*e*) 1,058	(*e*) Reserved lands.
Bombay and Sind .	13,763	(*f*) 1,337	(*f*) Protected lands, or areas, managed by other Departments.
Burma including the Andamans.	(*g*) 23,017	(*h*) 109,392	(*g*) 159 square miles of Reserved forests being in the Andamans. (*h*) 1,794 square miles of Unclassed forests being in the Andamans.
TOTAL .	94,230	149,309	
GRAND TOTAL .	243,539 Sq. miles.		

Certain Native States have followed the example set by the Government of India and have also shown interest in their forests ; some of the larger areas reserved or protected are given below :—

Name of State or Political Agency.	Reserved forests.	Protected forests.	REMARKS.
	Sq. miles.	Sq. miles.	
Mysore . .	2,366	667*	*Reserved lands.
Coorg . . .	476	30	
Baluchistan . .	282	496†	† Unclassed.
Kashmir . .	2,813	1,186	
Travancore (1905-06).	2,266	.	
Hyderabad (1907-08)	4,878	3,293	

Types of Forests.

General. Owing to the variations in climate, altitude, and to the vast areas over which the forests are distributed, several distinct types of forests are found, generally characterised by one or more dominant species. It is often not possible to draw a distinct line between any two types of forests, as one type merges into the other For instance, the Deodar forests gradually give place to those of Silver Fir and Spruce, while in other localities the dry deciduous pass gradually into moist deciduous, and the latter again into true evergreen forests. It is, therefore, only possible to define the zones containing distinct types of forest on the broadest lines, the limits of which not infrequently coincide with either the variations in altitude, the areas of greater or less rainfall, and the geological formation, or two or more of these factors combined.

Deodar forests. The North-West Himalayas of the Punjab and United Provinces contain the valuable conifer forests, the most important species in this type of forest being the Deodar, the timber of which is universally used for railway sleepers. Many other useful timbers are to be found in these forests, such as the Silver Fir, Spruce, Yew, Pencil Cedar, the Blue and Long-needled Pines, several species of Oak, the Himalayan Hazel, Elms, Walnut, Sycamore, Birch, Poplar, Willows and the Horse-chestnut.

Other Conifer forests. To the east of the above area and more or less in continuation of the same, though in most places containing a very different type of vegetation, come the forests of the Eastern Himalayas running through Nepal and the Khasia and Garo Hills of Eastern Bengal and Assam. The Deodar is absent in this region, though on the higher slopes of the Himalayas the Silver Fir, Spruce and a limited number of Yew, together with Oaks and Chestnuts in other places, cause the forests to resemble those of the Western area. At lower elevations the forests are composed of broad-leaved species and in places cane-brakes, Sissoo and Khair are found in the drier areas and along the water-courses, while in the upper limits of the Assam valley evergreen forests are found in which a great variety of species occur, important among which are the Nahor tree of Assam (*Mesua ferrea*), *Cedrela* spp. and Magnolias. Passing southwards to the Cachar valley, into Chittagong, the Lushai Hills, and down to the Arakan Yomas, the types of forest vary from locality to locality and vast areas are covered with many great trees along the rivers and on the alluvial soils, such as *Dipterocarpus* spp., the Ajhar tree (*Lagerstrœmia Flos-Reginæ*), Nahor (*Mesua ferrea*), *Chickrassia* and many other more or less pmportant species. On the hills of Chittagong the height growth of the forest is not so great as in the plains and bamboos occur in great quantities. The Khasia Hill forests are noticeable as being the home of the Khasia Pine and a variety of Oaks, while in Arakan many of the forests consist of pure bamboos.

Sissoo and Khair forests.

Evergreens of Assam and Arakan.

Sal forests.

The area to the south of the Himalayan conifer forests and lying at the foot of the higher hills, including the Siwaliks and extending through the Garhwal, Ganges, Kumaun and Kheri Divisions on to the Nepal Terai and into the Garo Hills, contains the "Sal" forests of Northern India. It is from these forests together with the "Sal" belt in the Central Provinces that the greater percentage of the Sal sleepers is obtained for the Indian railways. Mixed with the Sal is a variety of species; in the lower hill forests the Chir Pine occurs, along the dry water-courses Sissoo, in other places Toon, Khair, *Albizzia* spp., Sain and a large variety of more or less deciduous trees often mixed with bamboos.

Babul forests.

In the dry areas of the Punjab, Rajputana, Sind, and extending down to West-Central India and Kathiawar, are found forests containing a very limited number of species, often growing to no great size; though the timber in default of anything better is of considerable value. The most important species, especially along the banks of the Indus, is the Babul growing into a fair-sized tree on irrigated land or near tanks. Of other species of importance may be mentioned the Khair tree, Bahan (*Populus euphratica*), *Capparis* and *Tamrix* species.

Deciduous forests of the dry zone.

To the south of the Jumna, extending across from Guzarat in the west, to Orissa on the east, and southwards through the Central Provinces, the Khandesh Satpuras, the Deccan, far down into the Carnatic country, are found to dry deciduous forests of India. The principal species in these forests are Teak in the west, centre and central-south of the area, Sal in the centre and east and Sandal in the extreme south, the Sal and Teak never being found actually growing together. Other kinds of trees of considerable importance occur with the above species, of which may be mentioned Sain or Ain (*Terminalia tomentosa*), Anjan (*Hardwickia binata*), Kosum (*Schleichera trijuga*), Blackwood (*Dalbergia latifolia* [the Gum Kino tree (*Pterocarpus Marsupium*), Red Sanders (*Pterocarpus santalinus*) in the south, Semul (*Bombax malabaricum*) and a large variety of other trees, the timber of which is generally speaking only used locally.

Forests of the Western Ghats.

To the west of the dry zone area and stretching from the Surat Dangs and Thana Districts down the Western Ghats through Kolaba, Kanara Malabar, the Nilgiris and Annamalais to Travancore, and in some places extending a considerable distance over the crest of the Ghats occur the dry to moist deciduous and evergreen forests peculiar to the locality. In the northern limits of this area, as also on the upper slopes of the Ghats, the forests are not unlike the dry deciduous forests of the Deccan and Central Provinces except that the Teak grows to a greater size and the other species are in proportion larger. Blackwood is, after teak, the next most important species, and is of greater size in this locality than in any other part of India.

Moist deciduous forests

The lower slopes of the Ghats, and the many valleys formed by the rivers of the West Coast, contain moist deciduous forests in which the Mutti and Hongal (*Terminalia tomentosa and paniculata*), Benteak or Nana (*Lagerströmia lanceolata*), Jamba (*Xylia dolabriformis*), Honne or the Gum-Kino tree (*Pterocarpus Marsupium*) and *Dillenia* spp. play an important part, being often mixed with masses of large bamboos.

Evergreen forests of Malabar.

Still lower down, in the excessively damp localities, in the ravines at the foot of the Ghats and on the shady side of the slopes, occur the dense evergreen forests, with straight-stemmed trees of great height, amongst which are found *Canariums*, *Callopyllums*, *Hopeas*, Mangoes, *Vitex*, *Sterculia alata*, *Diospyros*, *Vateria indica*, *Dipterocarpus*, *Mesua*, *Strychnos*, the latter especially towards the Coast, *Cinnamomum* spp., Palms and a variety of other more or less useful trees, the ground being often covered with canes. Towards the top of the Nilgiris and Annamalais, evergreens also occur but of a special type, known locally as "Sholas," consisting of laurels, *Rhododendron*, *Ilex*, *Symplocos*, *Elæcarpus*, *Eugenia*, etc., with an undergrowth of *Strobilanthes*.

Teak forests of Burma. In Burma several types of forest occur, the most valuable being the Teak forests of Tenasserim, the Pegu Yomas, Martaban Hills and the eastern slopes of the Arakan Yoma. Mixed with this valuable species, is Ironwood (*Xylia dolabriformis*), yielding excellent sleepers, the timber being superior to that of the same tree grown in Southern India. Other species found in this type of forest are *Terminalia*, *Eugenia*, *Homalium*, *Acacia*, *Albizzia*, *Careya*, *Gmelina* and often great quantities of bamboos.

"In" forests of Burma. Another very distinct type of forest is that formed by *Dipterocarpus tuberculatus*, the "In" or "Eng" tree, which yields a valuable timber, and forms in places nearly pure forests, being not unlike Sal in its habits.

Cutch forests of Burma. A distinct type of forest, which covers considerable areas in the drier regions of Burma is formed by the Khair tree (*Acacia Catechu*) from which the valuable product known as cutch is obtained.

Hill forests of Burma. In Northern Burma, at high elevations, there appear forests not unlike those of the Eastern Himalayas, in which the Khasia Pine, Oaks, Laurels and Rhododendron occur, but from a commercial point of view they are unimportant as compared with the Teak, In and Khair forests above described.

Andaman forests. The Andamans are generally classed with Burma, but contain certain species of great economic value, not found elsewhere. The most important of these are Andaman Padauk (*Pterocarpus dolbergioides*) and the Zebra wood (*Diospyros Kurzii*).

Tidal forests. Lastly, come the tidal forests of the Sunderbands, the mouth of the Irrawaddy, and the coasts of Tenasserim, Arakan and Malabar, foming types of their own, and largely consisting of Mangroves, Sundri (*Heritiera minor*), yielding a very valuable timber, *Sonneratia apetala* and a variety of other swamp species.

OUTTURN AND VALUE OF TIMBER, FUEL AND MINOR PRODUCTS.

Outturn. The total outturn of timber and fuel from Government forests. in 1907-08, was 234,982,123 cubic feet or approximately 4,699,642 tons. Out of the above total 65,365,555 cubic feet were timber and 169,616,568 cubic feet fuel, of which about 4½ million cubic feet of timber and 46 million cubic feet of fuel were removed by free-grantees and right-holders.

The number of bamboos exploited was 193,427,023, of which about 52 millions were removed free of charges by right and privilege-holders.

The number of cattle allowed to graze in the forest was a trifle over 15 millions, of which just over 4 millions were allowed to graze free and 2½ millions at privileged rates.

Revenue. The gross revenue from all sources was Rs. 2,58,62,979 and the expenditure Rs. 1,45,12,933, showing a net profit of Rs. 1,13,50,046, as against a net profit of Rs. 41,99,922 in 1887-88, or nearly treble in the short space of 20 years.

The value of the Minor Products removed by various agencies came to Rs. 71,39,241.

CHAPTER II.

MAJOR PRODUCTS.

General. Under the head of Major Products come all the timber and fuel produced by the forests. A great variety of different sorts of timber is available, far larger than is generally realized by the public. For instance, the number of tree species is about 2,500, while the number of woody climbers and shrubs is not far short of that figure. Out of the great number of tree species, only a certain percentage yield timber of value, some being suitable for one purpose, some for another; other species yield valuable fire-wood, and again some yield bye-products, such as cutch, agar-oil, oleo-resins, tan fruits, and dye flowers, fibres, or support the lac insect and silk-worm.

Important Major Products. The most valuable of the Major Products is without doubt Teak. To grade the other timbers according to their value is hardly possible; it is sufficient to state that Sal, Sandal, Sissoo, Blackwood, Deodar, Sundri, both Andaman and Burma Padauk, In or Eng, Ironwood, Red Sanders, Khair and Babul stand in the first class, and that it would be easy to name fifteen or twenty more species whose claims as useful timbers might be put forward with justice.

Annual outturn of Major Products.

To give an idea of the enormous annual outturn of timber and fuel from Government forests it may be stated that in 1908-09 it amounted to 226,470,000 cubic feet or roughly 4,529,000 tons, of which anything from 250,000 to 350,000 tons was Teak timber.

IMPORTANT SPECIES DEALT WITH.

Out of the many valuable timbers which might be described, 80 species have been selected, and dealt with separately, special stress being laid on the possible yield from stated localities, the quality and size of the timber obtainable, its approximate value—and to whom to apply for further information on the subject.

1. *Abies Webbiana*, Lindl, and *Abies Pindrow*, Spach. (The Himalayan Silver Firs.)

Distribution.—The Indian Silver Firs are tall stately trees, with cylindrical stems, found in the Himalayas, extending from Chitral to Bhutan, at 7-14,000 feet— and occasionally at even higher elevations.

Quality of the wood.—The wood of both species is not unlike that of the Indian Spruce, being white in colour, easily worked, weight about 30 lbs. per cubic foot, and therefore lighter than Deodar ; in strength, however they are hardly equal to that timber. They season fairly well, though if care is not taken they are liable to both heart and star-shakes. The timber is fairly durable under cover, but not so when placed in the open ; for instance, Silver Fir sleepers laid down on the Oudh and Rohilkhand Railway lasted hardly two years.

Uses.—The wood is used for a variety of purposes, being suitable for packing-cases and fruit-crates, and pronounced suitable for opium chests by the Behar Opium Agent, for wood-pulp by Sindall, for Army brush-boxes by a Cawnpore firm, and for tea-boxes (Troup). In the North-West Himalayas it is used for shingles, and also elsewhere for planking and house-construction, though not equal to Sal or Deodar for this purpose. The timber is used in carpentry, for such purposes as camp furniture, where lightness is an important factor. As before stated it is not suitable for sleepers, but might answer the purpose, were it first treated with an antiseptic solution.

Outturn and Value.—As an example of the possible outturn of this timber from various localities, the following details may be cited :—

Locality.	Outturn.	Size of logs or trees.	Approximate value.
Punjab.			
Dunga-Galli and Tandiana.	The Working-Plan allows 680 trees to be cut annually.	Minimum felling girth at breast-height, 8 feet.	Trees sell standing for about Rs. 12 each, and fuel at 1 anna per maund of 82 lbs.
Kangra Division .	The Working Plan contemplates 1,831 trees of both Spruce and Silver Fir being cut annually.	Minimum felling girth at breast-height, 7 feet 6 inches.	About Rs. 10 to Rs. 15 per tree.
United Provinces.			
Jaunsar Division .	The Working-Plan places the outturn at 800 trees per annum of Silver Fir and Spruce.	Minimum girth of trees at breast-height 6 feet.	Value of timber within 12 miles of Chakrata standing in the forest, 1 anna to 2 annas per cubic foot.

The Conservator of the Punjab estimates he could supply annually 42,000 broad gauge sleepers from the Kulu, Hazara, Bushahr and Chamba Divisions, the price being from Rs. 1-12-0, to Rs. 2 per sleeper. The Conservator of Forests, Kashmir State, gives the combined supply of Silver Fir and Spruce, landed at Jhelum as 2,000 tons per annum, and the present rates at 6 annas per cubic foot.

The timber procured from the Punjab forests and sent to Patna, cost 4 annas per cubic foot on rail. This amount does not include royalty charges, which would come to 2 to 3 annas per cubic foot.

An experiment was made in the Jaunsar Division as to the cost of floating out this timber to the foot of the hills. It cost 10 annas 5 pies per cubic foot to do so, but this, Mr. Milward, the Divisional Officer, considers could be considerably reduced, in light of previous experience.

Enquiries.—Enquiries for Silver Fir should be made of the Conservator of Forests, Lahore, Punjab, of the Conservator of Forests, Western Circle, United Provinces, Naini Tal, and of the Conservator of Forests, Kashmir.

Minor Products.—None of importance.

2. *Acacia arabica* Willd. (The Babul tree.)

Distribution.—A moderate-sized to large tree, probably found wild in Sind, Rajputana, Guzarat and parts of the Deccan, elsewhere cultivated or self-sown in the drier regions of India. The largest "Babul" areas are in Sind, where they cover 172,000 acres, chiefly in the Hyderabad and Jarrack Divisions. In Bombay Presidency proper, the area is 45,000 acres, chiefly occurring in East Khandesh, Sholapur, Ahmednagar and Nasik Divisions. In the Berars there are some 15,000 acres under Babul, in the Amraoti, Buldana and Akola districts. In Madras the chief Babul areas are found in the Kistna Division, while in the United Provinces the trees are in places fairly plentiful but very scattered.

Quality of the wood.—The sap-wood is white, the heart-wood varies considerably, being light-red to dull dark red-brown and in very old wood nearly black. The wood is hard and very durable, fairly heavy, weighing 56 lbs. per cubic foot. It is short-fibred and somewhat brittle to work, taking a smooth surface and good polish.

Uses.—The wood is used in native house-construction, for posts and beams, also for door and window-frames, for agricultural implements such as ploughs, harrows and handles, for nearly all parts of native carts, boats, oil mills, wells, buffers of railway carriages and tent pegs. It produces an excellent fuel and is or was extensively used for that purpose on the North-Western Railway.

Outturn and prices.—The outturn of Babul from Sind in 1909-10 was 104,114 cubic feet of timber and 9,100,234 cubic feet of fuel, which realized in the market 10 to 12 annas a cubic foot for timber and Rs. 5 to Rs. 15 per 100 cubic feet for fuel. The bark sells for Re. 1 to Re. 1-4 per maund of 80 lbs. In the Berars, the outturn is estimated by the Divisional Forest Officers as follows :—

As timber—

	Outturn.	Prices.
Akola Division . .	3,888 c.ft.	6 annas per c. ft.
Amraoti „ . .	1,541 „	4 „ „ „
Buldana „ . .	3,631 „	4 to 8 „ „ „

As fuel—

	Outturn.	Prices.
Akola Division	101,413 c.ft.	Rs. 11-0 per ton.
Amraoti "	81,199 "	Rs. 3-10 " "
Buldana "	14,526 "	Rs. 12-8 " "

The outturn for Bombay is not known but the conditions are similar to those of Berars, so that the 45,000 acres in Bombay may be estimated to yield about 400,000 cubic feet.

Enquiries and references.—Application for Babul from Sind should be made to the Deputy Conservator of Forests, Hyderabad ; from Khandesh, Nasik, Ahmednagar and Sholapur to the Conservator, Central Circle, Poona ; from the Berars to the Conservator of Forests, Amroati, and from the United Provinces to the Conservator of Forests, Eastern Circle, Naini Tal.

Minor products.—The most important minor products obtained from this tree are the bark, gum, and pods, for references to which see pages 129, 136 and 134 respectively.

3. *Acacia Catechu*, Willd. (The Khair tree.)

Distribution.—A moderate sized deciduous tree, found nearly all over India and Burma, especially in the drier areas, ascending to 3,000 feet.

Quality of the wood.—The wood is hard and very durable, the sapwood is whitish-yellow, the heart-wood is brick-red to dark brown-red in colour, close-grained, sometimes marked with white spots. It seasons slowly but fairly well, the sap-wood should be removed before the logs are put to season ; it is not attacked by white ants and is said to be immune to the attack of marine borers. It takes a very fine polish and absorbs little of the mixture. Weight about 66 lbs. to the cubic foot.

Uses.—On account of its great durability the timber is much in request in many parts of India for posts for native houses, it would also be most useful for sleepers, were logs of sufficient size obtainable. It is used for all parts of native carts, except the body, for which it is too heavy. It is also used for pestles and mortars, oil and sugar-mills, furniture, such as bedstead legs and chairs, tool handles, and agricultural implements. It has been used for piles in sea-jetties and also very extensively for fuel in Burma (Gamble). It has been tried for fishing-rods and pipes but was found unsuitable for these purposes.

Its most important use is for the manufacture of cutch and kath.

Outturn and value.—The tree being more or less distributed all over India and Burma, no data are available as to the gross outturn ; it must, however, be very large. The Conservator of Forests, Assam, gives an area of 18,480 acres covered with this tree in the Goalpara, Kamrup and Darrang Divisions, the annual yield of trees over 3 feet girth from the former and latter Divisions being 2,000 stems and 1,600 stems respectively. The Conservator of Bengal states that the number of young trees in the Jalpaiguri district is considerable, and that the tree should yield better metre-gauge sleepers than Sal. Troup states that the export of cutch from Burma in 1906-07, was 5,640 tons. Taking the yield as 10 per cent., the annual yield of wood comes to 56,400 tons.

In the South Canara district of Madras, at Wandse, the Working-Plan prescribes 3,000 trees to be cut annually.

For other places no definite information is available, though as before stated the tree occurs in fairly dry localities all over India and Burma.

The price of the wood varies, being up to Rs. 25 a ton for large straight logs.

Enquiries and references.—Enquiries as to yield and cost should be made of any of the Conservators or Divisional Officers throughout India and Burma.

Minor products.—The most important use to which this wood is put is for the manufacture of cutch and kath, for further information about which see page 123.

4. *Adina cordifolia*, Hook. (The Haldu tree.)

Distribution.—The Haldu tree is found scattered in nearly all deciduous forests of India and Burma, growing in favourable localities to a great size.

Quality of the wood.—The wood is very even-grained, moderately hard, lemon-yellow in colour when freshly cut, turning yellow-grey on exposure, if not polished at once. It works very easily and seasons well, though somewhat liable to fine heart and cup-shake cracks. Fairly durable, weight 45 lbs. per cubic foot.

Uses.—It is suitable for furniture making and in this connection was utilized with success by the Insein Jail in Burma. In Northern India combs are made of this wood. It is also used for packing-cases, small boxes, turnery, carving, brush-backs, toys and drums. In Southern India, where it grows in places on the West Coast to a great size, it is much prized for dugouts and large beams. It is not suitable for sleepers, having been tried in Madras for this purpose and failed in its fifth year. (Troup.)

Outturn and value.—The data available as to outturn are meagre, but it may be said that the tree is to be found in most deciduous forests of India and Burma, so that it can nearly always be procured locally. In the Kumaun Working-Plan the outturn is fixed as follows :—

Annual number of trees to be felled . .	. 600
Estimated average size	. 60 cubic feet per tree
Estimated price	. 4 annas per cubic foot

In Bahraich, United Provinces, the following rates for green timber have been furnished :—

Logs,	1st	class,	3′ 6″ and over	without bark,	2 annas per cubic foot
„	2nd	„	3′ to 3′ 6″	„ „	1 anna 6 pies per cubic foot
Poles,	1st	„	2′ 6″ to 3′	„ „	12 annas each
„	2nd	„	2′ to 2′ 6″	„ „	6 annas each
„	3rd	„	1′ 6″ to 2′	„ „	3 annas each.
„	4th	„	1′ to 1′ 6″	„ „	1 anna 6 pies each

The Conservator of Forests, Southern Circle, Bombay, fixes the annual yield of the North Division of Kanara at 500 tons and that of the East Division at 200 tons.

Its price varies enormously, rarely being less than 2 annas per cubic foot, while for large logs for special purposes it is as high as 8 annas per cubic foot. The price on the West Coast of Kanara is Rs. 24 to Rs. 32 per ton.

Enquiries and references.—Application for the wood should be made to Conservators or local Divisional Forest Officers.

Minor products.—None of importance.

5. *Albizzia Lebbek*, Benth. (The Siris tree.)

Distribution.—A large deciduous umbrella-crowned tree, found both cultivated and wild in the sub-Himalayan tracts from the Indus eastwards into Bengal and Burma, and throughout the Peninsula, attaining a large size in the Andamans. It is also found in the dry regions of Ceylon. It is a common tree in most deciduous forests and has been largely cultivated in gardens and along avenues.

Quality of the wood.—The sap-wood is yellowish-white in colour, the heart-wood dark red-brown. often containing dark brown-black streaks, giving it a very handsome appearance when polished. The wood is hard and fairly durable; the co-efficient of transverse strength according to Everett is 5·9 tons to the square inch. The weight varies considerably. Gamble gives examples ranging between 42 and 61 lbs. per cubic foot. The wood is known on the English market as "East India Walnut,"—not a satisfactory name, as it is apt to be confused with *Juglans regia*, the true Indian Walnut.

Uses.—The wood has a handsome grain rendering it suitable for fancy work such as panelling, carving, picture-frames, toys, combs and turnery. As to its value for furniture there seems to be some difference of opinion. Thurston, Troup and the Deputy Conservator, Andamans, favour it for that purpose, while the Superintendent of the Jail at Mandalay has recorded it as unsuitable. The latter officer prepared a camp table and almirah shelf of this wood and found it warped and split. For light camp furniture it is not suitable, being a heavy wood, but for large heavy furniture, provided the wood is well seasoned, it is probably valuable. The wood is also suitable for a variety of other purposes, such as posts for building, sugar and oil-mills, cart-wheels, canoes, well-curbs, and coopers' work in Madras (Troup). The "Burrs" are of great value for veneers, giving unique patterns and designs.

Outturn and value.—No definite figures are available for outturn. The tree, however occurs throughout India and Burma, and fair-sized consignments could be procured from most local officers.

The Deputy Conservator, Andamans, has from time to time sent consignments to Europe, which have commanded a ready sale. He states that he could supply 600 tons annually at about Rs. 70 per ton and that the wood sells as freely as Padauk.

The Conservator of Forests, Southern Circle, Bombay, puts the outturn in North Kanara at 50 tons, in East Kanara at 20 tons, and in West Kanara at 15 tons per annum. On the West Coast in Kanara it fetches Rs. 30 to Rs. 40 per ton.

The wood is worthy of the attention of timber merchants and carpenters in India. Gamble states that the "burrs" are worth ten to twenty times the value of the plain wood.

Enquiries and references.—Enquiries about the wood and "burrs" should be made of Conservators, local District Officers and the Deputy Conservator, Port Blair, Andamans.

Minor products.—The tree yields a gum not soluble in water and of no great value.

6. *Albizzia odoratissima*, Benth. (The Kala Siris.)

Distribution.—A large deciduous tree of the sub-Himalayan tracts, from the Indus eastwards into Bengal and Burma. Also found in Central, Western, and Southern India and Ceylon.

Quality of the wood.—The wood is similar to that of *Albizzia Lebbek*, having a whitish sap-wood and dark red-brown heart-wood, streaked with longitudinal dark bands. It is harder than the Siris wood. The Superintendent of the Behar Opium Factory states that the wood is very hard and difficult to work, a large amount being lost in the process of sawing. He further states that the wood looks well in a chest, is promising, and might with advantage be given a further trial. Peal, according to Gamble, says that it has an excellent reputation in Assam, and that the wood is durable. The wood is somewhat liable to split if not carefully and slowly seasoned. Its weight is 54 lbs. per cubic foot and has a high co-efficient of transverse strength equal to 6 518 tons per square inch (Unwin).

Uses.—The wood is fairly suitable for opium chests (Mann), is suitable for strong packing-boxes, for oil-mill grinders and barrels, furniture, posts, beams and rafters, all parts of wheels, shafts and possibly heavy furniture.

Outturn and prices.—A continuous supply on a large scale is probably not available from any locality. Small consignments could be procured from most parts of India. The price of the wood varies, being lower than that of Siris. It could probably be procured for Rs. 15 to Rs. 25 per ton in most localities.

Enquiries and references.—Enquiries should be made of the local District Officers, who could furnish enquirers with information as to local prices and supply.

Minor products.—The tree yields a brown gum of no great value.

7. *Anogeissus latifolia*, Wall. (The Dhaura or Bakli tree.)

Distribution.—A large tree, found in most deciduous forests of India, but not in Assam, Eastern Bengal or Burma. Where it occurs it is generally plentiful, though not often found of over 6 feet in girth and with a bole of over 30 feet in length.

The wood is grey in colour, with a small irregular very hard purple heart-wood. It has a twisted fibre on the radial section and a slightly wavy grain on the tangential section; it splits in a radial direction with difficulty. The co-efficient of transverse strength is considerable; tests carried out recently at Sibpur gave 5·41 and 6·25 tons to the square inch. Its weight is about 62 lbs. to the cubic foot. The timber is very elastic and tough. It is fairly durable under cover, though somewhat liable to split in seasoning. It is difficult to saw in a green state.

Uses.—It is used extensively for building and also as mining props in the Kolar gold-fields. It is universally used for axles of wheels in native carts, being very tough and strong. Being elastic, it is used in many parts of India for cart-shafts and to some extent for transport poles, for sugar-mills (Bengal), native cots (Punjab), axe-handles, native ploughs, agricultural implements and yokes. It is unsuitable for sleepers. It might be used for keys on railway lines, especially if first treated with an antiseptic.

Outturn.—The following is a summary of the outturn and value of the timber, as given by various Divisional Forest Officers :—

	Locality.	Approximate. possible outturn.	Approximate size of logs or trees.	Approximate price in forest.	Aproximate price at market or on rail.
Punjab	Kangra Division	5,000 cubic feet in poles and beams.	3 feet 6 inches girth, 20 feet clear bole.	Trees 3 feet to 3½ feet in girth, sell for 8 annas each.	At Pathankot or Hoshiarpur 12 annas per cubic foot.
	Simla Division	Fairly common in the mixed Sal forests	2 feet 6 inches girth, 25 feet clear bole.	.	10 annas per cubic foot.
Bengal .	Sambalpur Division.	Common in the Division.	4 feet girth, 30 feet clear bole.	Royalty 2 annas per cubic foot.	10 annas per cubic foot on rail.
	Palamau Division.	Fairly common	3 feet girth .	Rs 4-15 per cart-load of poles.	..
	Chaibassa Division.	Common .	3 to 5 feet girth and even up to 7 feet girth, 30 to 40 feet clear bole. The Working-Plan puts 6 feet as the minimum cutting girth.	3 to 4 annas per cubic foot.	At Cuttack the price is 6 annas per cubic foot.
	Sonthal Parganas Division.	Fairly common.	2 feet girth, 10 feet clear bole.	..	

	Locality.	Approximate possible outturn.	Approximate size of logs or trees.	Approximate price in forest.	Approximate price at market or on rail.
United Provinces.	Kumaun Division.	Common	6 feet girth and 40 feet clear bole.	4 annas per cubic foot.	The Divisional Forest Officer states that it is considered a very valuable tree in his Division and is much used for building purposes.
	Bahraich Division.	Very common	4 feet girth and 40 feet clear bole.	2 annas per cubic foot.	Bhinga market, 4 annas per cubic foot Bahraich market, 7 annas per cubic foot.
	Gonda Division	Very common, 95,734 cubic feet is the outturn for the last five years, it will be somewhat less in future.	6 feet girth and 30 feet bole.	3 to 4 annas per cubic foot for round logs under 20 feet long, 5 annas per cubic foot for logs over 20 feet long.	6 to 7 annas per cubic foot on rail.
	Bundelkhand Division.	Common	3 feet girth, 20 feet bole.	2 to 4 annas per cubic foot.	
	Kheri Division	Fairly common	5 feet girth and 35 feet clear bole.	..	..
Central Provinces.	Nimar Division	Common	3 feet 6 inches girth and 15 feet clear bole.	2 annas 9 pies per cubic foot in forest.	Re. 1 per cubic foot on rail
	Narsinghpur Division.	Fairly common	2 to 2½ feet girth and 10 feet clear bole.	From Re. 1 per 100 poles of 9" girth to Rs 21 per 100 poles of 30" girth.	Re. 1 per cubic foot at the following stations:— (1) Gotegaon. (2) Karakhel. (3) Narsinghpur. (4) Kareli. (5) Babai. (6) Mohpani.
	Damoh Division.	Common	2 feet, girth and 10 to 12 feet clear bole	Rs. 3 per 100 poles of 12" girth, Rs. 9-8 per 100 poles of 18" girth and Rs 20 per 100 poles of 24" girth.	About 2 annas per cubic foot at the following stations on the Great Indian Peninsula Railway:— (1) Sagoni. (2) Ghatera. (3) Damoh. About 5 annas per cubic foot at Jubbulpore and 13 annas per cubic foot at Bombay.

	Locality.	Approximate possible outturn.	Approximate size of logs or trees.	Approximate price in forest.	Approximate price at market or on rail.
Central Provinces—*contd.*	Saugor Division.	Common	2 to 3 feet girth and 10 to 12 feet clear bole	Poles under 12" girth at ½ anna each, of 12" to 24" girth 3 annas each and above 24" to 36" girth at 6 annas each	2 to 3 annas per cubic. foot at Kareli Railway station, and 2 to 6 annas per cubic foot at Saugor, Jernakhera and Ganeshganj Railway stations. At Jubbulpore about 8 annas per cubic foot, at Cawnpore and Agra 6 annas 6 pies per cubic foot and at Bombay 15 annas to Re. 1 per cubic foot.
	Balaghat Division.	Fairly common.	3 to 4 feet girth and 20 to 30 feet clear bole.	Poles 9" to 12" at 6 pies each. Poles 13" to 18" at 1 anna 6 pies each Poles 19" to 24" at 4 annas each. Poles 25" to 36" at 10 annas each.	..
	Bhandra Division.	Common	1½ to 2 feet girth, and 15 to 20 feet clear bole	..	..
	Bilaspur Division.	Common	4 feet girth, and 20 to 25 feet clear bole.	One anna per cubic foot.	5 annas per cubic foot at the Kargi Road Railway station for the first 10 miles lead from the forest; and at 1 anna per cubic foot more for each additional 5 miles lead.
	North Chanda Division.	Common	4 to 5 feet girth and 20 feet clear bole.	Poles up to 18" girth at 15 annas per cart-load, and above that at 3 annas 6 pies per cubic foot.	
	South Chanda Division.	Common	5 to 6 feet girth and 40 to 60 feet clear bole.	Poles at Rs. 4 per cart-load were sold in past years.	..
	Nagpur-Wardha Division.	Common	2½ feet girth and 20 feet clear bole.	Rs. 10 per 100 poles.	2 annas 6 pies per cubic foot on rail.

	Locality.	Approximate possible outturn.	Approximate size of logs or trees.	Approximate price in forest.	Approximate price at market or on rail.
Central Provinces —*concld.*	Raipur Division	Common	5 feet girth and 30 feet clear bole.	From Rs. 3-14-6 per 100 poles of 9" girth to Rs. 34-1-10 per 100 poles of 24" girth.	5 annas per cubic foot at Dhatari and Rajim stations, and 7 annas per cubic foot at Raipur Station.
Bombay	South Division, Thana	Common	3 to 5 feet girth and 20 feet clear bole.	Rs. 3 to 4 per 784 lbs. at depôt.	Rs. 4-5 per 784 lbs. in market. Charcoal Rs. 15 per 784 lbs
	Central Division, Thana.	Very common	5 feet 6 inches girth and 30 feet clear bole.	Ditto.	Ditto
	Panch Mahals Division	Common	3 to 4 feet girth, 20 feet clear bole.	Beams Rs. 2-8-3 per 10 mds of 40 lbs Rs 10 per 100 mds of 40 lbs for fuel.	
	Kolaba Division	Moderately common.	4 feet girth and 30 feet clear bole.	Rs 2-8 to Rs. 3-8 for 580 lbs.	..
	North Kanara Division.	Common above Ghats.	4 feet to 5 feet girth and 30 feet clear bole.	Rs 20 to Rs 25 per ton.	..
Madras	Madura Division	Very common	4 feet girth 25 feet clear bole	Below 18" girth Rs 18 to Rs. 25 per 100 poles, below 24" girth Rs. 35 to Rs 40 per 100 poles, below 36" girth Rs 50 to Rs. 80 per 100 poles.	On station 12 annas per cubic foot.
	Anantapur Division.	Fairly common	1 foot girth and 10 feet clear bole.	2 to 3 annas for a 10' long and 1' girth pole.	
	South Salem Division	Common, 11,616 cubic feet is the average sale for the last five years.	3 feet girth and 30 feet clear bole	*Rs 3 to Rs. 4 per pole of 2' 6" girth and 12' long	..
	Nellore Division	Fairly common	18 inches to 3 feet girth and 15 feet clear bole.	Poles 2' girth and 12' long sell for 8 to 12 annas each.	In Nellore Rs. 3-8 per ton.
	Kistna Division	Not very common.	2 feet girth and 6 feet clear bole.	Not sold much, being too short.	Imported and sold at Rs. 1-4 per cubic foot.

*This high price is given for mining props by the Kolar Gold Fields.

Enquiries and references.—Enquiries should be made of the Chief Conservator of Forests, Nagpur, Central Provinces; of the Conservator of Forests, Darjeeling, Bengal; of the Conservators, Eastern and Western Circles, Naini Tal, United Provinces; of the Conservator of Forests, Lahore, Punjab; of the Conservators of Forests, Central Circle, Poona; Northern Circle, Bandra; Southern Circle, Belgaum, Bombay; and of the Conservators, Southern Circle, Coimbatore; Central Circle, Madras; and Northern Circle, Waltair, Madras Presidency.

Minor products.—For reference to the gum of this tree, see page 137.

8. *Artocarpus Chaplasha*, Roxb. (The Chaplash tree.)

Distribution.—A very large deciduous tree, found eastwards from Nepal to Assam, in Bengal, Chittagong, Burma, and the Andamans.

Quality of the wood.—The wood is yellow to brown in colour, showing a nice even grain not unlike rough satinwood, moderately hard and durable, especially under cover. Co-efficient of transverse strength, according to Everett, 3·79 tons to the square inch. It seasons well, though somewhat liable to warp. Gamble, quoting Peal, says :—

" It is a really fine tree, having a remarkably good wood for many purposes, if not exposed to the weather or put in the ground. The wood would make excellent tea-boxes, but is really too rare and too good to use for such a purpose "

Uses.—It is a light wood, weighing about 34 lbs. to the cubic foot. Trees of very large dimensions are found in favourable localities. The wood being fairly soft and easily worked, is used for dugoutsr It is also used for cart-wheels (Kurz), packing-cases, inner lining of boats, house-building, especially for beams and planks, carving, turnery and furniture, for which latter purpose, Gamble, quoting the Chevalier Paganini, considers it equal to, if not superior to, teak.

Outturn —From the above-quoted paragraph by Peal, in which he says that the wood is too rare and good to be used for tea-boxes, it would appear that the supply is limited in Assam Burma and the Andamans have a larger supply. In 1907-08, 1,187 scantlings were exported from the Andamans. Sir H. Farrington, the Deputy Conservator,states that the possible yield would be about 2,000 tons annually and that the present price is about Rs. 25 per ton.

Enquiries and references.—Enquiries for this timber should be made of the Conservators of Forests of the Eastern and Western Circles, Eastern Bengal and Assam, Shillong; of the Chief Conservator of Forests, Burma; and of the Deputy Conservator of Forests, Port Blair, Andamans.

Minor products.—None of importance.

9. *Artocarpus integrifolia*, Linn. f. (The Jack tree.)

Distribution.—A large evergreen tree found wild in the dense forests of the Western Ghats. Brandis says it is found in the large dense forests of Burma, but only in the vicinity of deserted settlements. It is cultivated throughout India and Burma chiefly for its fruit.

Quality of the wood.—The wood is brown-yellow in colour when freshly cut, turning brown on exposure. It works easily, is fairly durable, seasoning readily, weight about 40 lbs. to the cubic foot. Co-efficient of transverse strength 3·053 tons per square inch (Unwin). It takes a good polish and has a very handsome appearance when worked up.

Uses.—On the West Coast the wood is much prized for carpentry, the Goanese carpenters in that locality use it extensively in preparing furniture, which is often well made and ornamental. It is also used for sea-going canoes by fishermen, for house-building especially in the form of beams, coopers' work, wheels of carriages and drums in Singhbhum (Troup). The rasped wood is used as dye both in India and Burma; in the latter country it is used by the priests to dye their clothes (Gamble). The wood is occasionally exported to Europe for cabinet-work.

Outturn.—Owing to the value of its fruit the Jack tree does not come on to the market in large quantities. In Kanara and Malabar a fair amount is procured annually by the local carpenters. The Kanara forest would probably have an output of from 100 to 200 logs per year. Mr. Brown of Malabar puts the outturn at 500 tons per annum. Mr. Coehlo states that the wood fetches Rs. 28 to 32 a ton at Karwar on the West Coast. The outturn from Burma is not known, but would be equal to, if not greater than, that of the West Coast.

Enquiries and references.—Enquiries for this timber should be made of the Conservator of Forests, Southern Circle, Belgaum, Bombay; the Conservator of Forests, Southern Circle Coimbatore, Madras; and the Chief Conservator of Forests, Burma.

Minor products.—For reference to the fruit of this tree see page 147.

10. *Artocarpus Lakoocha*, Roxb. (The Dhau tree.)

Distribution.—A large lofty deciduous tree, found from Kumaun eastwards. in Assam, Eastern Bengal, Burma, Orissa, Circars, Western Ghats, where it is common in the Yellapur forests, and in the Andamans.

Quality of the wood.—The heart-wood is yellow and changes colour to a dull brown on exposure ; fairly hard and durable, resists the attacks of white ants and possibly those of marine borers. Its co-efficient of transverse strength, according to Everett, is 6·83 per square inch. It works easily, and presents a fair appearance when polished. It emits an unpleasant smell while being sawn, possibly from the resinous nature of the wood. The weight of the wood is 40 lbs. per cubic foot, and therefore slightly lighter than that of Teak. Gamble states that the wood is highly prized at Port Blair.

Uses.—The wood is used in house-building, chiefly for beams. Canoes are made of it in Kanara and probably elsewhere. It is used for furniture, but does not equal Jack-wood for this purpose. It is also used for piles, sugar-mills, posts and rafters (Foulkes).

Outturn.—The fruit of this tree being more valued than the timber, the outturn would not be great, some 50 to 100 logs being possibly the annual outturn from localities where it is found. The Conservator gives the price in Kanara as Rs. 40 per ton.

Enquiries and references.—Enquiries for this wood should be made of the Conservators of Forests, Eastern and Western Circles, Shillong, Eastern Bengal and Assam ; the Chief Conservator of Forests, Burma ; the Conservator of Forests, Southern Circle, Belgaum, Bombay ; the Conservator of Forests, Southern Circle, Coimbatore, Madras ; and the Deputy Conservator of Forests, Port Blair, Andamans.

Minor products.—For reference to the fruit of this tree see page 147.

11. *Barringtonia acutangula*, Gaertn. (The Ijal tree.)

Distribution.—A moderate to large-sized evergreen tree, found from the Jumna eastwards into Oudh and Bengal. Also found in Central and Southern India, on the West Coast on alluvial ground, and along dry water-courses, and in Burma and Ceylon.

Quality of the wood.—The wood is nearly white in colour, even-grained, fairly durable, moderately hard ; the logs when cut radially have a handsome mottled appearance, due to the numerous broad medullary rays. Gamble says the wood is more durable than might be expected from its appearance. Talbot says it turns black when buried in mud. It lasts well under water. Weight 40 lbs. per cubic foot

Uses.—It is suitable for cabinet work, being ornamental if properly cut. It is also used for boat-building, well-curbs, frames of carts, rice-pounds. Troup says it has been tried on the Burma Railways for ballast-waggon bodies with some success.

Outturn.—Logs of fairly good girth are procurable on the West Coast and in Burma, but not logs of great length. There are a fair number of mature trees available, but owing to the habit that the tree has of growing on river banks, Forest Officers are generally not inclined to fell them for fear of the banks suffering. There is, however, always a certain quantity available, sufficient probably to supply local industries, such as furniture-making, as also for cartwrights, and boat-builders.

Enquiries and references.—Enquiries for this timber should be made of the Conservator, Eastern Circle, Naini Tal, United Provinces; the Conservator of Forests, Darjeeling, Bengal; the Chief Conservators of the Central Provinces and Burma; of the Conservator of Forests, Southern Circle, Belgaum, Bombay; and of the Conservator of Forests, Southern Circle, Coimbatore, Madras.

Minor products.—The bark of this tree is used for stupefying fish, otherwise the minor products which it yields are unimportant.

12. *Bassia latifolia*, Roxb. (The Mohwa tree).

Distribution.—A large spreading tree when grown in the open, but when found in dense forests, as for instance in the Western Ghats, it grows with a long straight bole, often 40 feet in length. It is found throughout the Deccan, Carnatic, West Coast, Central India, Guzarat, stretching as far north as Oudh and Kumaun, and eastwards across to Orissa. Much cultivated for its valuable fruit and flowers.

Quality of the wood.—The wood is brick-red to brown in colour, hard, durable, especially under cover, heavy, weighing up to 68 lbs., average 62 lbs. per cubic foot. It is not a handsome wood, and as it is difficult to work, it is therefore not suitable for the manufacture of small articles. It is classed as a very good timber for purposes in which weight is not a consideration, but where strength is required.

Uses.—Owing to the great value of its flowers and seed the tree is often only felled when it dies or has to be removed for special reasons. Some 2,000 trees recently sold in the Panch Mahals, Guzarat, fetched Rs. 6-8 each. These trees were bought for large beams, posts and rafters, for which the wood is most suitable. When shaped into dugouts it lasts well in fresh water. It is used, to a less extent, for turnery, naves of wheels, yokes, drums, and rough carving.

Outturn and prices.—The outturn from any locality must necessarily be small, unless owing to some special cause it is thrown on the market in large quantities.

The market rate for beams in Guzarat, cut from green trees, is Rs. 16 per 100 maunds (md. = 40 lbs.), for beams cut from dead trees Rs. 12 per 100 maunds. Green fuel fetches Rs. 6 per 100 mds. and dry fuel Rs. 7-8 per 100 maunds.

Enquiries and references.—Enquiries should be made of any local Forest Officer in India, except to officers whose jurisdiction is in the Himalayas and Assam where the tree is scarce or non-existent.

Minor products.—For reference to the seeds and flowers, see pages 125 and 124 respectively.

13. *Bischofia javanica*, Blume. (The Uriam tree of Assam.)

Distribution.—A moderate to large deciduous tree, found from the Jumna eastwards to Oudh, Gorakhpur, Bengal and Assam; on the Western Ghats from Castle Rock southwards, above Ghats in the Carnatic, and throughout Burma.

Quality of the wood.—The wood is red, rough, moderately hard. Weight 45 lbs per cubic foot. Logs of 6 feet in girth are fairly common in Assam, Burma and on the West Coast, but they are rarely of any great length. Gamble, quoting the Chevalier Paganini, says "that although above ground it warps and cracks and white-ants attack it, in the ground or under water it is almost imperishable." As regards its durability for sleepers, the Dibru-Sadiya Railway put its life at 4 or 5 years. They also state that it is liable to crack along the grain, but that they know of no other bad qualities. Troup calls it a very fair sleeper wood. The co-efficient of transverse strength, according to Everett, is 3·82 tons per square inch.

Uses.—It is used on the Dibru-Sadiya Railway for sleepers together with *Mesua ferrea*. It is also used for bridge construction, boards, dugouts, well-construction and piles. For the latter two purposes it is especially suitable, lasting well under water.

Outturn and value.—The only figures available as to supply are given by the Divisional Forest Officer, Goalpara, who puts the outturn of sleepers at 3,000 a year. Very large quantities of this wood could never be put on the market, as its distribution is generally restricted, being confined to river banks, nallas and swampy places. Assam and Burma could no doubt supply the largest quantities. As to price of the wood, the railways pay 10 annas per cubic foot for sleepers.

Enquiries and references.—Enquiries regarding the wood should be made of the Conservator of Forests, Eastern Circle, Naini Tal, United Provinces; the Conservators of Forests, Eastern and Western Circles, Shillong, Assam; the Chief Conservator of Forests, Burma, Maymyo; the Conservator of Forests, Southern Circle, Belgaum, Bombay; and the Conservator of Forests, Southern Circle, Madras, Coimbatore.

Minor products.—None of importance.

14. *Bœhmeria rugulosa*, Wedd. (The Geti or Dar tree.)

Distribution.—A small to middle-sized evergreen tree, found on the dry slopes of the Himalays up to 3,000 feet, extending from the Sutlej to Bhutan. Common in the Eastern Circle, United Provinces. Also found in the hills of Burma.

Quality of the wood.—An even grained, moderately hard, dull-red wood which lends itself well to working. It seasons without cracking or warping, weight about 40 lbs to the cubic foot. It is not procurable in the shape of large logs though of sufficient size for purposes for which it is required. Gamble says it is a tree that should always be encouraged owing to the value of its timber.

Uses.—The chief use to which this timber is put is for turnery work. In the Tista Valley of the Darjeeling district, as elsewhere, it is extensively used for this purpose in the manufacture of bowls, jars, cups and plates in which are kept ghee, butter and curds. It is also used for carving and in the preparation of small boxes, and though at present only used locally, is well worthy of the notice of artisans elsewhere in India.

Outturn and prices.—The wood is fairly plentiful in the Garhwal, Kumaun and Darjeeling districts Courthope says that a few trees only are sold on demand in the Garhwal Division for about Rs 2 per tree, and though it is difficult to make an estimate of the possible annual outturn, a fair number of logs are possibly available.

Enquiries and references.—Enquiries about the wood should be made of the Conservators, Eastern and Western Circles, Naini Tal, United Provinces; the Conservator of Bengal, Darjeeling; the Conservator, Western Circle, Shillong, Assam; and the Conservator of Forests, Punjab, Lahore.

Minor products.—None of importance.

15. *Bombax insigne*, Wall. (The False Semul or Didu tree.)

Distribution.—A large tree of the West Coast, Chittagong, parts of Burma and the Andamans.

Quality of the wood.—The timber is more durable than that of the well known "Semul" or 'Indian Cotton tree" (*Bombax malabaricum*). The wood is white in colour, weight about 30 lbs. per cubic foot. Three tests, carried out by Everett, gave its co-efficient of transverse strength as 2·79, 2·68, and 3·32 tons per square inch.

Uses—The wood is used for light packing-cases. In this connection the Manager of the Behar Opium Factory states: "This wood is unsuitable, being much too light and open in the grain. In my opinion the chests would not stand the rough usage our mango (wood) chests get. The sample logs sent us have not kept well, nearly all are badly cracked and have large ring shakes. This is a great pity, as the wood can be had plentifully from Government forests in the Andaman Islands. For ordinary packing-cases I believe this timber would answer very well. It is very easily sawn, and makes up well."

It is now used by the Opium Agent for the inside fitting of opium chests. It is suitable for paper-pulp, though somewhat difficult to bleach. The wood was tested by A. Roller of Berlin, who pronounced it one of the best woods for match splints, and match boxes.

Outturn and value.—The outturn in North Kanara is not large. It is found scattered in the forests of Chittagong, Arakan and Burma and fairly common in the Andamans, where large trees are to be found. The price of the wood depends largely on the difficulty of extracting the large logs. The Deputy Conservator, Andamans, puts the approximate possible annual yield at 2,000 tons and the price at about Rs. 25 per ton.

Enquiries and references.—Enquiries about this timber should be made of the Chief Conservator, Burma, Maymyo; of the Conservator of Forests, Eastern Circle, Eastern Bengal and Assam, Shillong; the Conservator of Forests, Southern Circle, Belgaum, Bombay; and the Deputy Conservator of Forests, Port Blair Andamans

Minor products.—None of importance.

16. *Bombax malabaricum*, DC. (The Semul or Indian Cotton tree.)

Distribution.—A very large deciduous tree, found throughout India, Burma and Ceylon, chiefly found in deciduous forests and also often scattered in cultivated areas and near villages. It grows to a great size, more so in the drier localities than in very wet ones Trees of 15 feet girth, 6 feet from the ground, are by no means uncommon in the Deccan, Guzarat and elsewhere.

Quality of the wood.—The wood is white when freshly cut, the tree having no heart-wood. Gamble says that the wood when seasoned in the log gets discoloured. This defect can be overcome by cutting the log into planks while still green, or by seasoning in fresh water. The wood is perishable if exposed to the air, but lasts well under water. Weight 23 to 25 lbs. per cubic foot, soft, easily-worked and seasons quickly.

Uses.—The wood is used for light packing-cases, for dry goods boxes and would do well for fruit-crates. In Assam it is used for tea-boxes, elsewhere for dugouts and water-troughs, also being used for the troughs employed in the manufacture of cutch. Owing to the ease with which it can be worked it is used for making wooden toys, spoons, cups and drums. A. Roller of Berlin says it is one of the best match woods found in India, and Raitt says that it yields wood-pulp about equal to that of Poplar, bleaching easily. It is also used for scabbards, fishing-floats, coffins and well-curbs (Gamble).

Outturn and value.—Though the tree is found all over India and Burma, the supply is by no means inexhaustible For instance, large quantities of mature trees formerly existed in the Panch Mahals Division in Guzarat. It took about 8 years for one match factory to clear practically all the mature trees out of the place. There are, however, large numbers of mature trees in most divisions where deciduous forests occur, though often very scattered and rarely, if ever, found in very large quantities within a confined area, so that the cost of extraction is often considerable The price of the wood in the forest does not generally exceed 4 annas a cubic foot, and is generally below that figure.

Enquiries and references.—Enquiries for this timber should be made of the local Divisional Forest Officers or Conservators.

Minor products.—For reference to the floss and seed obtained from the Cotton tree, see pages 117 and 128, respectively.

17. *Boswellia serrata*, Roxb. (The Salai tree.)

Distribution.—A moderate-sized to large tree, common throughout the dry region of India, most common on the shallow-soiled hills of Central India, the Deccan, Orissa, Rajputana and Carnatic country, in places forming nearly pure forest. Not found in Assam, and rarely in Burma.

Quality of the wood.—The sap-wood is white, the heart-wood dull-brown to grey-brown in colour, moderately hard ; if cut on the radial section, it presents a smooth, shiny surface of fair appearance. The weight of the wood varies considerably, ranging between 28 and 42 lbs. per cubic foot. It is not durable. Professor Dunstan mentions a case of five sleepers put down on the Holkar-Neemuch State Railway, which were perfectly sound after five years, having been previously soaked in a tank filled with *Terminalia belerica* leaves. This is an exceptional instance, as five years is probably more than the usual life of Salai sleepers.

Mr. Mann of the Behar Opium Agency after having tried this wood for opium-chests writes :—

> "A further experiment was made in 1907 (with Salai wood). Again the sample log sent us had received bad treatment in the course of seasoning. I believe this timber would, with ordinary treatment, be suitable for making chests, although it is not so durable or strong a wood as mango."

Uses.—The wood being common and cheap, it is used for rough packing cases, sometimes for construction work, such as frames of doors and windows, also for turnery work, such as bowls and wooden vessels. Roller says it is suitable for matches. Troup mentions it as being used for mica-boxes in Bengal, for masts of boats in the Central Provinces, and as water-pipe boards and for coopers' work in Madras. It is hollowed out into water-troughs in Guzarat. It yields a poor quality of paper-pulp, being short-fibred and very difficult to bleach It is extensively used for fuel and charcoal-making, especially in such localities where other species are scarce. It burns well, but somewhat quickly.

Outturn and value.—The possible outturn in the Deccan, Rajputana, Guzarat, along the Satpuras, in the Central Provinces and Carnatic is very considerable, the Khandesh district alone would be able to turn out one or two thousand tons annually, it being one of the commonest trees in the forests of that district.

Professor Dunstan gives one or two instances as to the price of this timber. He states that in Pegu a log 18 feet long and 6 feet girth sells for Rs. 10 ; he gives another instance of similar logs selling for Rs. 7. Again, he states that in Amraoti the value of this wood is one-fourth that of *Lagerströmia parviflora* poles. The average price of this timber might be put at Rs. 5 for a log 6 feet girth and 18 feet long in the Deccan or Guzarat, or about 2 annas per cubic foot in the forest.

Enquiries and references.—Enquiries for this timber should be made of Conservators of Forests, Eastern and Western Circles. United Provinces, Naini Tal ; the Chief Conservator of Forests, Central Provinces, Nagpur, the Conservator of Forests, Bengal, Darjeeling ; the Conservators of Forests, Northern Circle, Bandra ; Central Circle, Poona, and Southern Circle, Belgaum, Bombay Presidency , and the Conservators of Forests, Northern Circle, Waltair ; Central Circle, Madras, and Southern Circle, Coimbatore, Madras Presidency.

Minor products.—For reference to the gum of this tree, see page 138.

18. *Butea frondosa*, Roxb. (The Palás or Dhák tree.)

Distribution.—The Palás or Dhák tree is found throughout the plains of India, Burma and Ceylon, often in poor deciduous forests, in open lands, and along the edges of cultivation.

Quality of the wood.—The wood is nearly white when freshly cut, turning a grey-brown colour on seasoning. It is not durable when exposed in the open, but lasts wonderfully well under water. Weight about 35 lbs per cubic foot.

Uses.—Gamble says it is used as well-curbs in Upper India, it is also used extensively for this purpose in the Deccan and Guzarat. A well-curb taken up while repairing a very old well in the Panch Mahals was found to be perfectly sound, the timber having outlasted the brick masonry. The timber was examined some months afterwards, when it was found to be practically nothing but dust. The wood is also used for well-scoops, rough packing-cases, wooden dishes, spoons, ladles, etc. It yields a poor fire-wood and an inferior wood-pulp.

Outturn and value.—Logs of large dimensions are rarely obtainable, nor are they often very straight. Most divisions in the plains could produce some 50 tons or more per annum. The price of the timber does not generally exceed 2 to 3 annas a cubic foot, except possibly for comparatively large logs required for special purposes, *Enquiries and references.*—Enquiries should be made of any of the Conservators in India or Burma or of local Divisional Forest Officers.

Minor products.—For reference to the uses of the gum and flowers obtained from this tree, see pages 137 and 135 respectively.

19. *Calophyllum Inophyllum*, Linn. (The Wuma tree.)

Distribution.—A large evergreen tree, found on the West Coast, rarely extending far above Ghats, on the Orissa Coast, in Burma, and the Andamans.

Quality of the wood.—The wood is wavy in structure, of red-brown colour, fairly hard, cross-grained, but of handsome appearance. Weight about 40 lbs. per cubic foot; co-efficient of transverse strength, according to Everett, 3·36, 4 83 and 4·32 tons to the square inch. The timber is fairly durable and very elastic, working to a smooth surface and taking a good polish. Dr. Balfour states that it is used in Ceylon for masts and cross-sticks in fishing-boats and as poles for bullock-carts. It is used for ship-building, masts and spars on the West Coast. Gamble, quoting Sebert, says that it is a magnificent wood for cabinet-making, and this one can well understand.

Outturn and value.—It is a fairly common tree in Kanara where some 100 tons could be procured yearly. It is also available from the Malabar Divisions in about the same quantities as from Kanara. It is said to grow to a great size in the Andamans, but the quantity available is not large. No figures are available from Burma, but the outturn must be considerable. Its price on the West Coast, in the forest, is 4 annas to 6 annas per cubic foot, while the Divisional Forest Officer, Malabar, states that it sells for Rs. 24 per ton in the Beypore depôt and that the freight by boat to Bombay is Rs. 5 to Rs. 6 per ton.

Enquiries and references.—Enquiries should be made of the Chief Conservator of Forests, Maymyo, Burma; the Conservator of Forests, Southern Circle, Belgaum, Bombay; the Conservator of Forests, Southern Circle, Coimbatore, Madras; and the Deputy Conservator of Forests, Port Blair, Andamans.

Minor products.—For reference to the seed-oil of this tree, see page 128.

20. *Calophyllum tomentosum*, Wight. (The Poon-spar tree.)

Distribution.—A large evergreen beautifully straight-stemmed tree found on the West Coast, generally below Ghats. It is not found north of Goa, and extends southwards to Travancore

Quality of the wood.—The wood is of reddish-brown colour, and of a streaky, wavy appearance. It is very elastic, and seasons fairly well though subject to radial shake. To avoid this it is often seasoned in the mud of tidal rivers. Its weight is about 37 lbs. per cubic foot. Transverse strength 5·14 tons per square inch. The wood is fairly durable. Sleepers laid down on the Madras Railway began to deteriorate in their 5th year. It lasts for over 10 years as masts of ships. It is a superior timber to that of the last described species, *Calophyllum Inophyllum.*

Uses.—It is primarily used on the West Coast for masts and spars and is superior even for this purpose to the wood of *Lagerströmia lanceolata,* which is also much used for ship-building. The timber is also valued for posts and beams in house-construction, and Troup says it is occasionally used for railway carriages, furniture and coopers' work. It has been used in the Naval Dockyard, Bombay, as spars, masts, and crane shafts.

Outturn and value.—The outturn is now somewhat limited owing to the former large demand made upon the available supply. The North Kanara forests could supply 200 logs per year and the Malabar outturn is put by Mr. Brown at 1,200 tons. The outturn of the whole West Coast and Travancore could safely be put at 2,000 tons per year. The price of this wood varies enormously Gamble, quoting Beddome, states that a single spar has fetched as much as Rs. 1,000. The present rate in North Kanara is from Rs. 40 to Rs. 60 per ton on the Coast, while the cost of freight to Bombay is from Rs. 5 to Rs. 7 per ton. Sawn scantlings at Kallai, *f o.r.* Malabar, fetch Rs. 1-10-6 and planks Rs. 1-12-6.

Enquiries and references.—Enquiries for this timber should be made of the Conservator of Forests, Southern Circle, Belgaum, Bombay ; the Conservator of Forests, Southern Circle, Coimbatore, Madras ; and the Conservator of Forests, Travancore.

Minor products.—The oil from the seeds is used for similar purposes to that of *Calophyllum Inophyllum.*

21. *Carallia integerrima*, DC. (The Carallia tree.)

Distribution.—The tree is found in semi-evergreen and evergreen forests and damp localities at the foot of the Himalayas, in Bengal, Assam, Chota Nagpur, Chittagong, the Circars, Western Ghats of Kanara and Malabar and Burma, chiefly in Pegu and Tenasserim.

Quality of the wood.—The sap-wood is light-brown, the heart-wood a darker brown. The wood is hard and durable and not liable to insect attack, though somewhat liable to radial shake while seasoning. The silver grain of the wood obtained by cutting it on a radial section is extremely handsome. There seems to be some difference of opinion as to how this wood works. Mr. Herbert Stone reports that it is difficult to plane on a radial surface, while an Indian firm stated that it is easy to work. In making picture-frames of this wood there appeared to be no difficulty in working it. Its weight is about 45 lbs. to the cubic foot, while tests for transverse strength carried out by Everett, came to 4·083 and 5·1 tons to the square inch.

Uses.—Troup says the wood is used for house-building, furniture, rice-pounds (Burma), agricultural implements (Madras) and handles of spears and "dahs" in Burma. It makes very handsome picture-frames, and is most suitable for ornamental work, such as veneered panels for railway carriages, in place of "bird's-eye maple," which timber is now largely employed for this purpose in India, and which is more expensive than Carallia wood.

Outturn and value.—Troup in his "Note on Carallia wood" gives the possible annual outturn in Burma as 500 logs, and states that a limited supply could be procured from the Darrang, Nowgong, Cachar and Lakhimpur Divisions of Assam, and possibly also from the Chittagong, Kamrup and Sibsagar Divisions. In North Kanara some 50 to 100 small logs could be obtained annually, and a similar amount from North and South Malabar. He gives the following list of prices for various Divisions :—

Name of Province.	Name of Division.	Prices.
Eastern Bengal and Assam.	Kamrup . .	Rs. 2 per tree in forest.
	Cachar . .	10 annas per cubic foot in the local market.
	Nowgong . .	Rs. 2 per tree in forest.
Burma . . .	Toungoo . .	Rs. 9 per log or ton in market.
	Ataran . . .	Rs. 1-8 per log 4′-6″ girth and over, 12 annas per log of 3′ to 4′-6″ girth in forest.
	Thaungyin . .	Ditto ditto.
	South Tenasserim .	Ditto ditto.
	Tharrawaddy .	Ditto ditto.
	Rangoon . .	Ditto ditto.
Bombay . .	North and West Kanara.	Rs. 1-8 per kandi or Rs. 6 per ton in forest.

Enquiries and references.—Enquiries about the timber should be made of the Chief Conservator of Forests, Burma, Maymyo; the Conservators of Forests, Eastern and Western Circles, Eastern Bengal and Assam, Shillong; the Conservator of Forests, Southern Circle, Bombay, Belgaum; and the Conservator of Forests, Southern Circle, Madras, Coimbatore.

Minor products.—With the exception of the oil from the seed, which is occasionally used, the tree yields no minor products of importance.

22. *Careya arborea*, Roxb (The Kumbi or Kumbia tree.)

Distribution.—A large deciduous tree found in the United Provinces, Bengal, the Punjab, the Peninsula and Burma, often in moist deciduous forests. It grows in many places to 6 feet girth and over, though the bole is generally not of great length.

Quality of the wood.—The heart-wood is dull-red in colour, turning darker on exposure, and is also darker in old trees than in young ones. It cuts to a smooth surface and is fairly hard and strong P. is recorded by Gamble as being about 800 or 6 43 tons per square inch. He also states that it is a fine wood, which is too much neglected, that it is durable, and gives instances of this. Heinig, quoted by Gamble, says t is sold as 2nd class wood in the Andamans, squaring up to 30 feet in length with a 2 feet side. It splits somewhat in seasoning.

Uses.—The timber is used in house-building, for agricultural implements, wheels of carts, furniture, dugouts, cabinet-work, gun-stocks, etc. Troup says it might be used for paving blocks. It yields poor paper-pulp.

Outturn and value.—The possible outturn is considerable, as though scattered in most forests it is by no means an uncommon tree in many places. The price in the forests rarely exceeds 2 to 4 annas per cubic foot. Owing to the way the tree occurs scattered in the forest, the cost of felling and collection becomes in some cases excessive.

Enquiries and references.—Enquiries should be made of any local Divisional Forest Officer or Conservator in India and Burma.

Minor products.—For reference to the bast fibre of this tree, see page 116.

23. *Cassia Fistula*, Linn. (The Indian Laburnum.)

Distribution.—A moderate-sized tree, found throughout the forests of India and Burma, often cultivated. A most useful tree and very ornamental. It rarely grows to a great size, and logs over 4 feet girth and 20 feet long would be hard to procure, though the logs are naturally fairly straight.

Quality of the wood.—The wood is generally red to brick-red, darkening to dull-red on exposure. It is very hard and not easily worked, being brittle. Weight about 60 lbs. per cubic foot. Gamble gives P. as 588 and 846, which corresponds to 4·72 and 6·77 tons per square inch respectively. The wood is durable and very well suited for heavy work.

Uses.—It is chiefly used for house-building, as posts, beams and scantlings, being very strong, also for nearly all parts of the wheels of carts, for rice-pounders, boat-building, agricultural implements, such as ploughs and tool handles. The logs are generally of too small a size to use for sleepers Gamble, quoting Graham Anderson, recommends it for bed-plates for machinery. It yields excellent fuel and charcoal.

Outturn and price.—The outturn could never be great as it is not one of the common trees in deciduous forests. However, where procurable, the timber is of considerable value.

Enquiries and references.—Enquiries about the timber should be made of local Forest Officers and Conservators.

Minor products.—For reference to the pods and bark, see pages 147 and 131 respectively.

24. *Castanopsis Hystrix*, A. DC. (The Indian Chestnut.)

Distribution.—A very large evergreen tree of the Eastern Himalayas, in Sikkim and Bhutan, Assam and the Khasia Hills, often found growing to a great size.

Quality of the wood.—The wood is grey-brown, fairly durable, hard, weight about 46 lbs. to the cubic foot.

Uses.—It is much used for shingles, as it withstands wet fairly well, Gamble says more so than most other species. The wood is used for house-building, Hart says, especially for verandah posts, flooring and scantlings. It is also used for all parts of wheels for native carts, shafts and agricultural implements. It is a bad firewood as it throws out sparks, but on the other hand makes good charcoal.

Outturn and prices.—Mr. Hart, the former Conservator of Bengal, states that the tree is fairly common at 5,500 and 7,500 feet in the Darjeeling district. The royalty prices are 4 to 6 annas per cubic foot. The supply is readily bought up locally.

Enquiries and references.—Enquiries about the timber of this tree should be made of the Conservator of Forests, Eastern Circle, Shillong, Eastern Bengal and Assam; and of the Conservator of Forests, Darjeeling, Bengal.

Minor products.—With the exception of the fruit, which is edible, the tree yields no important minor products.

25. *Casuarina equisetifolia*, Forest. (The Casuarina tree.)

Distribution.—A fast growing, very tall straight, tree, found in a natural state on the sandy coast of Chittagong, Arakan, especially in the vicinity of Kyaukpyu, Tenasserim and the Andamans. Fine plantations have been formed in the Tanjore, Nellore and Arcot districts, and also on the West Coast, in the North Kanara and Malabar districts.

Quality of the wood.—The wood is light-brown to brown in colour, long-fibred, and liable to split and crack, but this tendency to split can be largely overcome if the timber is seasoned slowly. The wood is hard or fairly hard, and not easy to work. It is not durable when exposed to the air but fairly so under cover. Its weight is about 50 lbs to the cubic foot and its transverse strength, according to Skinner, quoted by Gamble, is 7·39 tons per square inch. It is therefore even stronger than teak.

Uses.—The wood is largely used for fuel, being exported for this purpose in large quantities from North Kanara to Bombay and from Nellore to Madras. The logs, which are generally very straight and long are used as beams, posts and rafters. They are also used as masts, but are inferior to *Calophyllum tomentosum* or *Lagerströmia lanceolata* for this purpose. The timber is also used occasionally for yokes, felloes and wheels of native carts.

Outturn and prices.—The greatest quantity of this timber is to be obtained from the Madras districts of Nellore, North and South Arcot and Tanjore, where extensive fellings take place annually in the plantations. In Nellore about 370, in North and South Arcot 160, and in Tanjore 90 acres are felled annually. The Nellore plantation situated in the Coast Range of that district, has yielded approximately 8,446 tons of timber annually during the last 10 years, which sold for about Rs. 5 per ton (average price of the last three years).

In North Kanara the oldest plantations are 40 years old and are estimated to contain 3,700 cubic feet of timber and fuel per acre. The Working-Plan prescribes fellings over 12 acres annually and thinnings over 30 acres. The amount realized is from Rs. 400 to Rs. 450 per acre, and the price of this firewood in Bombay is Rs. 15 to Rs. 18 per ton, while the cost of shipping from Karwar to Bombay comes to Rs. 4 to Rs. 6 per ton.

Enquiries and references.—Enquiries regarding the timber should be made of the Conservator of Forests, Central Circle, Madras; of the Conservator, Southern Circle, Belgaum, Bombay; and of the Conservator of Forests, Eastern Circle, Eastern Bengal and Assam, Shillong.

Minor products.—The bark is sometimes used for tanning leather and dyeing fishing nets, otherwise the minor products yielded by this tree are unimportant.

26. *Cedrela Toona*, Roxb. (The Toon or Red Cedar)

Distribution.—A very large deciduous tree, found in the valleys of the sub-Himalayas from the Punjab eastwards to Sikkim and Assam, extending to Burma; also found in the Peninsula in Western and Southern India. Very extensively cultivated and planted as a road-side tree.

Quality of the timber.—The wood is of rose to dull-red colour, working to a smooth shiny surface, with prominent lines on the longitudinal cut, representing the pores. It takes a fine polish, but requires a considerable amount of filling before polishing and absorbs a comparatively large amount of the solution. The timber seasons quickly and is durable under cover. It does not warp or split, but shrinks and expands with variations of temperature and moisture. Its weight is about 35 lbs. to the cubic foot and its co-efficient of transverse strength may be taken as 3·74 tons to the square inch, it being, therefore, both lighter and not so strong as teak. Gamble says it is not attacked by white-ants.

Uses.—The timber is universally used in India for all kinds of furniture, being one of the best timbers procurable for this purpose. It is exported to Europe from Burma and known on the market as Moulmein Cedar, and according to Gamble there fetches Rs. 65 per ton. It is used for planks and tea-boxes in Assam, cigar-boxes in Madras, and for carving elsewhere Troup states that it is used for oil-casks in Travancore, dugouts and sampans in Chittagong, and for musical instruments, toys, etc.

Outturn and prices.—Owing to the value of this species the timber has been largely worked out from many of the Government forests, though Gamble states it has not been largely exploited from the Chittagong Hill tracts. On the other hand, it has been extensively cultivated both in and outside the forests, and being an extremely fast-growing tree the supply has been fairly well sustained. In order to illustrate the outturn and prices in some of the Divisions of the Eastern Circle of Eastern Bengal and Assam, the following figures, given by Mr. Carter, the Conservator, may be quoted. The following quantities passed the Revenue Stations in the Silchar Division during 1909-10 :—

	c.ft.
Sonai Revenue Station	5,785
Matijuvi " "	12,648
Sialtek " "	365
TOTAL	18,798

Of this amount about 5% was used in the Divison, the rest being exported. The market price of scantlings is given as Re. 1-8 to Re. 1-10 per cubic foot.

In Sibsagar Division, from which the lead is long, standing trees sell for Rs. 4 to Rs. 6, or 2 annas per cubic foot, while in the market it fetches 10 annas to Re. 1 per cubic foot.

In the Shillong market the price is Re 1-12-0 to Rs. 2 per cubic foot.

In Dehra Dun the price is from Rs. 2. to Rs. 2-4 per cubic foot.

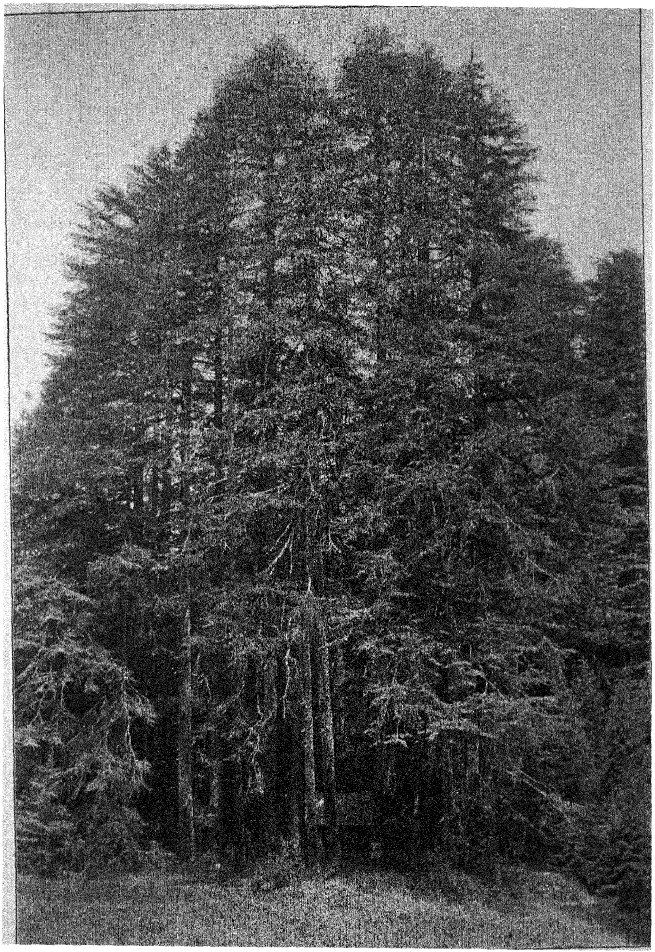
The Principal of the Mayo School of Art, Lahore, states that in 1875-76 "Toon" was extensively used for furniture-making, but since then its use has declined. He states that it is sold at Kartarpur near Beas for 8 annas to Re. 1 per cubic foot, and that the purchasers after selecting the better stuff from the lots re-sell it at higher rates.

Enquiries and references.—Enquiries for this timber should be made of the Conservators of Forests, Lahore, Punjab; Eastern and Western Circles, Naini Tal, United Provinces; Darjeeling, Bengal; Eastern and Western Circles, Shillong, Eastern Bengal and Assam; Northern Circle, Bandra, and Southern Circle, Belgaum, Bombay; Southern Circle, Coimbatore, and Central Circle, Madras, Madras Presidency; and the Chief Conservators of the Central Provinces and Burma at Nagpur and Maymyo respectively.

Minor products.—For reference to the dye yielded by the flower, see page 135.

27. *Cedrus Libani* Barrel var. *Deodara,* Loudon. (The Himalayan Cedar.)

Distribution.—A very large, tall, stately tree of the Western Himalayas, extending from 4-10,000 feet, but more commonly found between 6-8,000 feet. It extends far westwards into Afghanistan, but does not pass eastwards beyond the Kumaun district. Being a very ornamental tree, besides being of great value, it is often planted both in India and Europe.



[illegible] at the Offices of the Survey of India, Calcutta, 1911.

A Group of Deodar trees. Girth 10 ft., height 150 ft., Jaunsar Division, U. P.

[*to face page 38.*

Quality of the wood.—The wood is light yellow-brown in colour, with darker lines running through it, strongly scented, oily and fairly hard. As regards the durability of Deodar timber, it will last under cover well over 20 years, and often far longer, while its durability in the form of railway sleepers may be taken as 10 to 12 years. The Bhavnagar-Gondal Railway Company gives its life as 8 years, while within 12 years 8% of the sleepers require replacing. The North-Western Railway Company gives the life of sleepers as 16 years. The weight of Deodar timber varies, the stem-wood being generally lighter than the branch-wood The average weight of the former may be taken at 35 lbs. per cubic foot. The coefficient of transverse strength of the timber, according to experiments made at Roorkee, was 4 72 tons per square inch, while those made at Sibpur gave 4 14 tons per square inch. The timber seasons well, and owing to the oil in the wood does not become easily water-logged. It takes a fair polish, presenting a moderately good appearance when worked up

Uses.—The primary use of the timber is for railway sleepers. It is also used for bridge-construction, and for house-building in Jaunsar and elsewhere, as beams, rafters, door and window-frames, boards and shingles. It is also used for boxes, packing-cases, camp furniture and in general carpentry. Troup states that it is used for telegraph poles on the North-West Frontier, elsewhere for masts, oars, well-construction, beer-vats and by the Ordnance Department for barrow wheels, transport-boxes, etc. A Calcutta firm have pronounced the wood suitable for pencils, and that it is even better for this purpose than *Podocarpus neriifolia.*

Outturn and prices.—The outturn of this timber from Government forests alone is considerable. To illustrate the possible annual yield from some Government forests, the following figures are given :—

Locality.	Past annual outturn	Possible future annual outturn.	Value	REMARKS.
PUNJAB.				
Bushahr Division .	The average annual outturn for the last 11 years, ending 1892, was 1,64,080 cubic feet.	The Working Plan fixes the future annual outturn at 1,200 stems of 6 feet in girth or over	The average value of the timber for the last 11 years, ending 1892, was — Logs = 9 24 annas per cubic foot, sawn scantling = 11 66 annas per cubic foot, in the depôt	The 1,200 trees to be extracted annually will be felled in five Working Circles.

Locality.	Past annual outturn.	Possible future annual outturn.	Value.	REMARKS.
PUNJAB—*contd.*				
Kulu Division .	The average annual outturn, for the last 15 years ending 1895-96, was logs 24,697 cubic feet, scantlings 25,656 cubic feet. Total 50,353 cubic feet.	The Working-Plan fixes the future yield at 1,900 stems of 6 feet girth and over, or approximately 124,200 cubic feet per annum.	The average value of the timber for the last 15 years ending 1895-96 was — Logs = 11·16 annas per cubic foot, sawn scantlings = 12·83 annas per cubic foot at the depôt.	
UNITED PROVINCES.				
Jaunsar—Bawar .	..	The Working-Plan fixes the future yield at 1,570 stems of over 6 feet girth.	Within 12 miles of Chakrata 14 annas per cubic foot, and elsewhere standing trees fetch Rs. 20 to Rs. 50 per tree.	
Tehri-Garhwal Leased forests	.	The Working-Plan fixes the future yield at 1,551 stems of over 6 feet girth.	Trees sold standing fetch from Rs. 45 to Rs. 50 per tree.	

The following figures give an idea of the amount of Deodar timber which is being exported annually from Government and Native State forests, and which finds its way down the Tons and Jumna rivers. It is collected by a boom at Dakpathar, just below the junction of the two rivers, whence much of it finds its way to Jagadhari Station, North-Western Railway, for sale.

	No. of pieces.	Cubic feet.
Broad-gauge sleepers, 10 feet long . .	191,599	670,596
" " " 8 feet long . .	40,678	101,695
Metre gauge "	146,493	219,739
Slabs	7,731	11,596
Other sawn pieces	5,456	5,456
TOTAL .	391,957	1,009,082

As regards the price of Deodar railway sleepers, an idea may be formed of their value by quoting from the Report of the International Railway Congress of 1902.

The North-Western Railway state Rs. 3-6-0 for broad-gauge sleepers.

The Oudh and Rohilkhand Railway, Rs. 3-8-0 for broad-gauge sleepers.

The East Indian Railway, Rs. 3-14-0 for broad-gauge sleepers.

The Jodhpur-Bikaneer Railway, Rs. 1-12-0 for metre-gauge sleepers.

The Rajputana-Malwa Railway, Rs. 1-10-0 for metre-gauge sleepers.

As regards the present rates for landing Deodar timber at Howrah, Mr. Milward, the Deputy Conservator of Forests, Jaunsar, states as follows :—

> "On the Railway at Jagadhari Station, there is plenty of Deodar to be had at 14 annas per cubic foot. The railway rates are as follows :—One closed Oudh and Rohilkhand Railway wagon holds 500 maunds, or 300 broad-gauge sleepers (10′ × 10″ × 5″), if dry. The cost works out to 7 annas 1 pie per cubic foot for full wagons and 13 annas 3½ pies per cubic foot for small quantities. It would cost on the whole about Re. 1-7-0 per cubic foot to land unselected timber at Howrah, including loading, etc."

Enquiries and references.—Enquiries for this timber should be made of the Conservator of Forests, Lahore, Punjab, and of the Conservator of Forests, Western Circle, Naini Tal, United Provinces.

Minor products.—With reference to the oil of Deodar, see page 122.

28. *Chloroxylon Swietenia*, DC. (The Satin Wood.)

Distribution.—A moderate-sized deciduous tree, found from the Satpura Range southwards, in the Deccan and Carnatic country, common in the Northern Circars and also in Ceylon. In the north it is found only as a small tree, on going south it grows to a greater size, the largest trees being found in Ceylon.

Quality of the wood.—Satin-wood is of lemon-yellow colour, very hard and durable. Gamble states that sleepers of this wood last 20 years in Ceylon. The co-efficient of transverse strength of the timber is stated by that author as being 8·04 tons to the square inch, and the timber is therefore considerably stronger than teak. A planed surface presents a very smooth, shiny appearance, often handsomely figured. Its weight is approximately 60 lbs. to the cubic foot.

Uses.—The most important use of this timber is for ornamental work, such as cabinet-making, panels, veneers, and furniture of all kinds. It is also used in building and bridging. Gamble says that the Peradeniya bridge near Kandy was entirely built of this timber. Its other uses are for agricultural implements, native cart-wheels, brush-backs, picture-frames, and similar fancy work.

Outturn and prices.—The wood is exported to Europe chiefly from Ceylon, and to a less extent from India, being known on the market as "East Indian Satin Wood."

The largest outturn from Indian forests is from the Godavari District of the Northern Circle, Madras. The price of the wood at Colombo is stated by Gamble as being from Rs. 2-8 to Rs. 7 per cubic foot. The July, 1908, quotations for Satin-wood in England are given by C. Leary & Co. of London as 8*d.* to 1*s* 6*d* per superficial foot.

Enquiries and references.—Enquiries for this timber should be made of the Conservators, Northern Circle, Waltair and Central Circle, Madras, Madras Presidency ; of the Conservators of Forests, Central Circle, Poona and Southern Circle, Belgaum, Bombay Presidency ; and of the Conservator of Forests, Kandy, Ceylon.

Minor products.—None of importance.

29. *Cupressus torulosa*, Don. (The Himalayan Cypress.)

Distribution.—A large evergreen tree, found in the outer Himalayas from Chamba to Nepal ; not available in great quantities, being local in its distribution.

Quality of the wood.—The heart-wood is light red-brown in colour, with darker streaks denoting the annual rings. It is moderately hard, close-grained, works easily to a clean smooth surface. Gamble says it is very durable, and in this respect equal to Deodar. Weight 35 lbs. per cubic foot.

Uses.—The timber is suitable for sleepers, but is not procurable in sufficient quantities for that purpose. It is used in building, chiefly in the construction of temples ; also for shoulder-poles and furniture. After repeated trials it has been pronounced very suitable for pencils by a native firm in Calcutta

Outturn and price.—The possible outturn is not very large, but sufficient probably to meet such demands as may be made on it for the manufacture of pencils. Mr. Milward, Divisional Forest Officer, Jaunsar, states that he had 53 trees for sale in 1910 and that on demand arising that number could be trebled. The price in Calcutta would be somewhat over Rs. 45 per ton

The Deputy Commissioner of Garhwal makes the following estimate of this timber in the Garhwal forests :—500 very large trees are available, each weighing 10 tons, so that 5,000 tons of wood are available from that district. I doubted the size of the trees, but the Conservator, Mr. Clutterbuck, confirms the statement as to size.

A pencil factory using 250 tons of wood per annum could therefore be run for 20 years from this supply alone.

Enquiries and references.—Enquiries should be made of the Conservators of Forests, Eastern and Western Circles, Naini Tal, United Provinces, and of the Conservator of Forests, Lahore, Punjab.

Minor products.—None of importance.

30. *Dalbergia latifolia*, Roxb. (The Blackwood or Rosewood of Southern India)

Distribution.—A large deciduous tree, found from Oudh southwards throughout the Peninsula and attaining its greatest size on the Western Ghats, where it grows to 8 feet girth and over.

Quality of the wood.—The wood is purple in colour, with bands of darker-coloured wood running longitudinally through it The timber is very hard and durable, somewhat cross-grained, so that care has to be taken in working it. It takes a fine polish, which gives it an extremely handsome appearance Its weight is approximately 50 lbs. per cubic foot, and Gamble gives its transverse strength as 7·64 tons per square inch.

Uses—The timber is extensively used by the Ordnance Department for gun-carriage wheels, ammunition-boxes, rammers, brake-blocks, etc. It is exported to England for furniture and cabinet work, and is also largely used for that purpose in India. The Madras Railways use it for the internal fittings of Railway carriages. It is also used in construction and building, for tool-handles, combs, musical instruments, high class brush-backs, walking-sticks, boxes, etc.

Outturn and prices, Bombay Presidency—The total amount of Blackwood on hand in Government depôts, in the South Circle at the end of 1907-08 was 36,131 cubic feet. The chief districts producing large logs are Belgaum and the North, East, South and West Kanara Forest Divisions. The amount extracted annually according to the Working-Plans is 1,704 trees of 6 feet girth and over. Mr. T. R. Bell, the Conservator, puts the possible outturn from the North Division, Kanara, at 1,000 tons, that of the South Division at 50 tons, from the East Division at 75 tons and from the West Division at 50 tons per annum. The prices vary considerably, good logs fetchfng from Rs. 60 to Rs. 80 per ton on the coast at Karwar. The timber can always be purchased at the annual sales at Tarjatti depôt in Belgaum district or from any of the Coast depôts of Karwar and Hattikerri in West Kanara. Shipping to Bombay from Karwar comes to Rs. 6 per ton. From the Central and Northern Circles the supply is limited, the largest amount being obtainable from Khandesh, Nasik, Surat, Thana and the Panch Mahals. In the latter named district Mr. Thomson, the Divisional Forest Officer, states that poles up to 36″ girth sell for Rs. 3 to Rs. 4 each.

Madras Presidency.—The outturn of Black-wood from all classes of forests in Madras during 1907-08 was 22,861 cubic feet. The South Malabar District produces and exports the greatest amount of this timber. In 1906-07, 1,045 logs and 219 planks were exported from Calicut, the value of the sawn timber being Rs. 3 a cubic foot at Calicut and Rs. 2 and over at Manjangad. The royalty at Calicut is Rs 85 per ton in the Government depôts. The freight-rates from Calicut to Bombay by sea are about Rs. 10 to Rs. 12 per ton. The cost of delivery of Blackwood from the Malabar Coast to Madras is estimated, including royalty, at Rs. 150 per ton.

The South Coimbatore Division produced an average of 912 cubic feet annually during the last four years ending 1908 This timber was sold at Re. 1-3-1 per cubic foot.

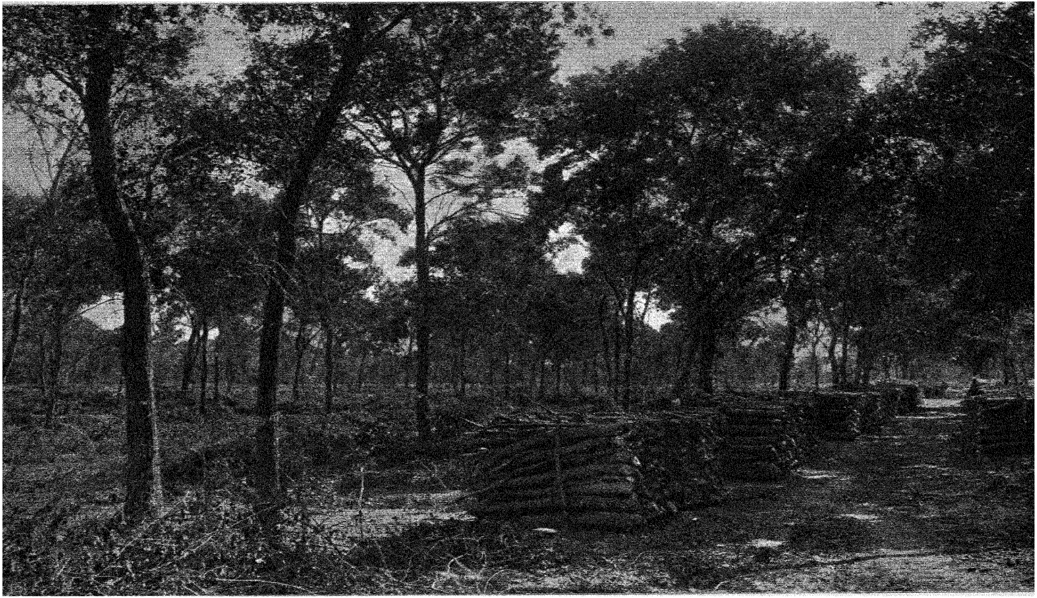
Central Provinces.—The Chanda Division is estimated to be capable of yielding 3,000 cubic feet of large logs per annum.

Coorg State.—The Coorg forests are stated as being capable of yielding 2,000 cubic feet of large and 4,000 cubic feet of small logs per annum. Good logs of up to 5 feet girth sell standing for Re. 1-8-6 to Re. 1-9-6 per cubic foot.

Enquiries.—Enquiries for this timber should be made of the Chief Conservator of Forests, Nagpur, Central Provinces ; of the Conservators of Forests, Central Circle, Poona, Southern Circle, Belgaum, and Northern Circle, Bandra, Bombay Presidency , and of the Conservators, Central Circle, Madras, and Southern Circle, Coimbatore, Madras Presidency.

Minor products.—None of importance.

PLATE II.



Dalbergia Sissoo **plantation**, showing fuel extraction. Changa **Manga**, **Punjab**.

[*to face page 45*.

31. *Dalbergia Sissoo*, Roxb. (The Shisham tree of Northern India.)

Distribution.—A moderate-sized to large deciduous tree of the sub-Himalayan tracts, extending from the Indus eastwards into Assam, not found often above an elevation of 3,000 feet. It has been much cultivated in other parts of India, but is probably not indigenous, except in the north.

Quality of the wood.—The heart-wood is brown, with bands of darker-coloured wood running longitudinally through the lighter-coloured tissue. In general structure it resembles Black-wood (*Dalbergia latifolia*) and in every respect takes the place in Northern India of that of the Black-wood of Southern India. The wood is hard, close-grained, durable, and seasons well without warping or splitting. In appearance when polished it is little inferior to Black-wood. It has the advantage over Black-wood of being somewhat lighter, weighing approximately 48 lbs. per cubic foot. Gamble gives its maximum transverse strength as 7·42 tons per square inch and minimum as 4·87 tons per square inch.

Uses.—It is chiefly used in making furniture, for which purpose it is especially suitable. It is also excellent for all parts of wheels of carts and carriages, shafts, frames of carts, for agricultural implements, oil and sugar-mills, poles, posts, game requisites such as tennis poles, cricket stumps, etc., in turnery work for toys, carving, coopers' work and boat-building. It has been used to some extent by the Ordnance Department, and would no doubt be more commonly used were the supply larger. It yields a good fuel and excellent charcoal.

Outturn and prices.—The tree is generally found growing along dry river-banks, and unless it is cultivated it is not often found scattered regularly through the forests. The supply is therefore somewhat restricted though the timber can always be obtained in moderate quantities in all timber centres in the north. It has been cultivated in the Changa Manga plantation in the Punjab, where annual fellings are now made.

The Divisional Forest Officer, Goalpara, Eastern Bengal and Assam, estimates the possible annual outturn from his Division at 7,000 sleepers.

The Conservator of Forests, Punjab, puts the annual outturn of really large logs at 2,000 cubic feet, and prices 8 annas per cubic foot *in situ*.

In the Bahraich Division of the United Provinces the price of Sissoo is about equal to that of Sal. The Working-Plan for that Division gives the rates as follows :—

1st class logs,	3′ 6″ in girth and over	9 annas per cubic foot in the forest
2nd ,,	3′ to 3′ 6″ girth	6 ,, ,, ,, ,,
1st class poles,	2′ 6″ to 3′ ,,	Rs. 3 12 each.
2nd ,, ,,	2′ to 2′ 6″ ,,	,, 1 14 ,,
3rd ,, ,,	1′ 6″ to 2′ ,,	,, 0 15 ,,
4th ,, ,,	1′ to 1′ 6″ ,,	,, 0 6 ,,

In Dehra Dun sawn planks 1″ thick and 1 foot broad may be had at 2 to 3 annas per running foot.

Enquiries and references.—Enquiries should be made of the Conservator of Forests, Lahore, Punjab ; of the Conservators of Forests, Eastern and Western Circles, United Provinces, Naini Tal ; the Conservator of Forests, Bengal, Darjeeling ; and the Conservator of Forests, Western Circle, Eastern Bengal and Assam, Shillong.

Minor products.—None of real importance.

32 *Diospyros Ebenum*, Kœnig. (Ebony.)

Distribution.—A large tree in Ceylon, not growing to a large size in India. It is found in the Berars in small quantities, in Khandesh and hills of the Deccan, also in the Cuddapah and Kurnool districts of Madras, but nowhere common.

Quality of the wood.—The heart-wood of this tree produces the true ebony of commerce, being the only tree of this order that has an absolutely black heart-wood. Weight approximately 70 lbs. to the cubic foot. It takes a fine polish, absorbing little of the mixture.

Uses.—The wood is only used for fancy work, such as carving, toys, ornaments, walking-sticks, piano-keys, brush-backs, etc.

Outturn and prices.—The outturn from India is very small. In Ceylon the possible output is from 300 to 400 tons per annum. It is largely exported to Europe, where it fetches £20 and over per ton.

Enquiries and references.—Enquiries should be made of the Conservators of Forests, Central Circle, Poona, and Southern Circle, Belgaum, Bombay Presidency ; of the Conservator of Forests, Northern Circle, Waltair, Madras Presidency ; and of the Conservator of Forests, Ceylon.

Minor products.—Nil.

33. *Diospyros Kurzii*, Hiern. (The Andaman Marble-wood or Zebra-wood.)

Distribution—An evergreen tree of moderate size, found in the Andaman Islands.

Quality of the wood.—The wood is black in colour, with grey irregular-shaped streaks running longitudinally down the fibre and with occasionally black oblong spots occurring in the lighter coloured tissue. The wood is hard, close-grained, seasons with difficulty, and is liable to split. Weight 60 lbs. per cubic foot.

Uses.—The timber is only used for fancy work, such as ornamental furniture, walking-sticks, carving, picture-frames, which when made up present a somewhat quaint and unique appearance. Herbert Stone, quoted by Troup, says that the wood is well known to turners and makers of Tunbridgeware.

Outturn and prices.—Mr. B. B. Osmaston, Conservator of Forests, says that the Forest Department would sell it at Port Blair at Rs. 6 per cubic foot *f.o.b.* The outturn is stated as being 500 cubic feet per annum.

Enquiries and references.—Enquiries should be made of the Deputy Conservator of Forests, Port Blair, Andaman Islands.

Minor products.—Nil.

34. *Diospyros Melanoxylon*, Roxb. (The Tendu tree.)

Distribution.—A large deciduous tree of the centre of the Peninsula, common in the dry regions of the Central Provinces, the Deccan, Carnatic and Guzarat. *Diospyros tomentosa*, which Gamble makes into a separate species, and Brandis classes as a variety, occurs in Northern India. The two timbers are very difficult to distinguish one from the other, and for commercial purposes may be considered as the same.

Quality of the wood.—The sap-wood is yellow to brown, with an irregular-shaped false heart-wood, black in colour, streaked with dark purple lines. The heart-wood is hard, shiny on being cut, difficult to work, being brittle, takes a good polish, but seasons with difficulty. Weight about 60 lbs. to the cubic foot.

Uses.—It is used for the same purposes as the true ebony, and much resembles that wood, except that it is not always entirely black in colour. The sap and heart-wood together are used for cart-poles and beams (Guzarat), and the heart-wood for brush-backs, walking- sticks, turnery, carving, screens, picture-frames, etc.

Outturn and prices.—The outturn is far greater than that of true ebony. It is a common tree in the Panch Mahals, Guzarat, in Khandesh, Nasik and most Deccan districts, the Central Provinces, and Berars, while the variety *Diospyros tomentosa* is common in West Saharanpur and Bijnor (Gamble). A large quantity of this timber can be procured annually from the Central and Northern Circles of Bombay, from the Berars and from the Western Circle, United Provinces. The prices vary entirely according to the size of the heart-wood, which is never large, pieces of 6″ diameter being considered fine samples. The price of the heart-wood varies from Rs. 25 to Rs 50 per ton in the forest. It is imported from the Central Provinces to Nagina at Rs. 14 per maund of 82 lbs.

In Guzarat Mr. Thomson, the Divisional Forest Officer, Panch Mahals, gives the following rates :—

For beams Rs. 4 to Rs. 5 per gaz of 20 maunds of 40 lbs. Poles for carts Rs. 3 to Rs. 4 each, if up to 36 inches circumference and 18 feet long.

Enquiries and references.—Enquiries should be made of any of the Bombay Conservators ; of the Chief Conservator of Forests, Central Provinces, Nagpur ; and of the Conservator of Forests, Western and Eastern Circles, United Provinces, Naini Tal.

Minor products.—With the exception of the leaves, used in making native cigarettes, for a note on which see page 155, and the edible fruit, the minor products are unimportant.

35. *Dipterocarpus tuberculatus*, Roxb. (The "Eng" or "In" tree of Burma.)

Distribution.—The " In " tree is found throughout Burma, in suitable localities up to 2,500 feet in altitude, from Myitkyina district in the north to Mergui in the south. In the Shan States it extends east to the Salween river and westwards into Chittagong and Arakan. It is found in Burma as a very large tree, with a straight clean cylindrical bole, carrying its girth well up the stem to 50 or 60 feet, the total height of an average tree being 80 to 90 feet.

Quality of the wood.—The sap-wood is small, of greyish-brown colour, the heart-wood red to red-brown, straight-grained with long pores, often filled with resin, hard, fairly durable, especially under cover ; the co-efficient of transverse strength 5·3 tons to the square inch, weight 52 lbs. per cubic foot. The wood has a strong aromatic smell when first cut, due to the large quantities of resin in the ducts. It is said to take a good polish, but liable to crack if converted green (Troup).

Uses.—The wood is used for house-building, chiefly as boards for flooring, roofing, ceilings, and in-door work. It is not recommended for out-door work without being previously treated with a wood-preservative. It is used for boat-building, dugouts, canoes, paddles, rudders, cart-frames, axles, yokes, shafts and in the manufacture of rough furniture. If treated with an antiseptic, it very likely might prove a most useful timber for railway sleepers.

Outturn and prices.—There is a good demand for "In" wood in Burma, it being one of the commonest woods found in the market at Mandalay, Toungoo and Pyinmana. The present outturn is about 80,000 logs per annum, which, according to Troup, the future yield will be about 50,000 tons per annum. The local prices for this timber vary considerably, being from Rs. 5 per ton in the Upper Chindwin Division, Rs. 12 to Rs. 25 per ton in Moulmein and Rs 10 per ton in Mandalay. On the West Coast the price is about Rs. 40 per ton, the supply being limited to 100 to 200 tons per annum.

Enquiries and references —Enquiries for this timber should be made of the Chief Conservator of Forests, Rangoon, Burma.

Minor products.—For reference to " In " oil, see page 140.

36. *Dipterocarpus turbinatus*, Gaertn. f. (The Gurjan-oil tree.)

Distribution.—A lofty evergreen tree, found in the forests of Cachar, Chittagong, Burma and the Andamans It grows to a great size in favourable localities, attaining occasionally a height of 200 feet and a girth of 12 feet and over.

Quality of the wood.—The wood is red-brown in colour, moderately hard, very oily, though not very durable. Weight 50 lbs. per cubic foot; strength, according to Skinner, quoted by Gamble, 5·12 tons per square inch.

Uses.—Though the timber is used for several purposes, the greatest value of this tree lies in the oil which it yields. The size of the logs procurable, which in the Andamans are said to square up to 60 feet in length with a 2 feet side, allows it to be used for large dugouts. It is also used to a certain extent for planking, for tea boxes and packing-cases.

Outturn and prices.—It is exploited from the Andaman forests and sawn up by local purchasers for export to Calcutta and Madras. The total amount of timber exported by sea from that locality in 1907-08 was 3.329

cubic feet, while the Deputy Conservator places the possible annual outturn at 12,000 tons and the approximate present price at Rs. 25 per ton. In Burma it is a fairly common tree and is mentioned as a possible wood for sleepers.

Enquiries and references.—Enquiries for this timber should be made of the Chief Conservator of Forests, Burma, Maymyo; the Conservator of Forests, Eastern Circle, Eastern Bengal and Assam, Shillong; and the Deputy Conservator of Forests, Andamans, Port Blair

Minor products.—For reference to Gurjan-oil, see page 140.

37. *Erythrina suberosa*, Roxb. (The Pangra, Dauldhak or Madara tree.)

Distribution.—A moderate-sized deciduous tree, found in the dry forests of India and Burma, especially in the Siwaliks, Berars, Central Provinces, the Deccan, extending eastwards to Orissa, becoming scarcer in the south of the Deccan and Carnatic country.

Quality of the wood.—The wood is white to grey-brown in the centre, soft, fibrous, with prominent medullary rays, giving it a mottled appearance if split or cut radially. In spite of the softness of this wood, it is sufficiently durable and light to make it of use for many purposes. Its weight rarely exceeds 18 to 20 lbs. to the cubic foot. Troup says it is durable under water. It is used for sieve-frames, packing-cases, water-troughs, planking, boxes intended for lacquer work, and scabbards for native swords (Gamble). It has been passed as suitable for both the inside and outside of match-boxes, as well as for match-splints (Evance).

Outturn and price.—Large numbers of trees are rarely found grouped together in the forests, though they may be fairly evenly distributed throughout the area. A certain number of stems are, therefore, generally to be had in each year's felling area. Trees are rarely sold separately, but together with other species in one lot; consequently it is not possible either to give a definite outturn or price for any given locality.

Enquiries and references.—If logs should be required for any special purpose, such as match-making, it would be advisable to enquire from local timber merchants direct or through the local Forest Officer.

Minor products.—None of importance.

38. *Eugenia Jambolana*, Lam. (The Jaman or Black-plum tree.)

Distribution.—A branching, moderate-sized to large evergreen tree found throughout India, Burma and Ceylon. Often cultivated; frequently found in its wild state along river banks, in damp localities. Thus it has been noted as being scattered in the semi-evergreen forests on the West Coast in North Kanara,' growing to 7 and 8 feet in girth, with clean straight boles up to 50 feet in length.

Quality of the wood.—The wood is reddish-grey in colour, coarse, moderately hard, fairly durable. Gamble states that it lasted five years and remained fairly sound when laid down as sleepers; nor was it attacked by white-ants. Troup states that sleepers tried in Madras deteriorated in their 8th year. Its weight is 48 lbs. per cubic foot and its co-efficient of transverse strength, according to Skinner, 4·82 tons per square inch.

Uses.—The timber is most suitable for house-building, chiefly for posts, beams and rafters It is also used in the construction of carts, being especially good for all parts of the wheels. Its other uses are for boat-building and well-curbs. The Manager of the Opium Factory at Patna gave this timber a trial and reported on it as follows :—

> "In appearance it is rather like mango, and I believe it would be suitable for opium-chests, but the price is prohibitive."

Outturn and prices.—The local requirements and uses to which this wood is put, together with the limited supply of the timber, make the amount available for export, anyhow on the West Coast, very doubtful. The price varies between 4 to 8 annas a cubic foot in the forests of Western Kanara. In Burma and Chittagong the outturn is large, and considerable quantities are available.

Enquiries and references.—Enquiries for logs for special purposes should be made of the local Divisional Forest Officers or timber merchants.

Minor products.—Besides the fruit of this tree, for reference to which see page 147, the only other minor products of any importance are its bark, which is used for tanning, and its roots used in the preparation of native medicine.

39. *Ficus bengalensis*, Linn. (The Banyan tree.)

Distribution.—A very large tree, found throughout India, often cultivated in India and Burma, forming magnificent avenues and camping grounds, amongst which may be mentioned the famous avenue in Ahmedabad and the great tree in the Royal Botanical Gardens, Calcutta.

Quality of the wood.—The wood is grey in colour, moderately hard, not durable, though more so under water than when exposed to the air.

The grain is moderately handsome if the logs be cut on a radial section. Weight 36 lbs. per cubic foot.

Uses.—The timber is of no great value, being used for well-curbs in the absence of more suitable species, such as *Butea frondosa* : it is also used to a limited extent in the construction of native huts. Troup says the harder wood of the aerial roots is used for yokes, shafts, tent and shoulder-poles.

Outturn and prices.—The tree is not often felled unless to make room for a better species, or if it dies or is damaging crops or endangering dwelling-houses. The possible outturn is therefore very limited.

Enquiries and references.—Enquiries regarding this timber should be made of the local Forest Officer.

Minor products.—None of importance.

40. *Gmelina arborea*, Roxb. (The Shivani or Kumhar tree.)

Distribution.—A moderate-sized to large deciduous tree, found scattered throughout India and Burma. It grows to a fair size in the Panch Mahals in Guzarat, where a tree is recorded of 7′ 5″ girth, 4½′ from the ground. Gamble says it is most common in Eastern Bengal, Chittagong and Burma. Formerly it was common in the Satpuras, but owing to the privileges given to the Bhils, who well knew the excellent quality of the timber, it has now nearly disappeared from that locality. It is very scarce on the Western Ghats. It is easily cultivated from the seed.

Quality of the wood.—This species is of the same Natural Order as teak, and for certain purposes rivals the timber of that species. It is yellow to light-red in colour, even-grained and easily worked, durable, seasons well and evenly; when worked up it presents a good appearance; strong but light, not weighing more than 36 lbs. per cubic foot, and therefore some 10 lbs. less than teak.

Uses.—Owing to the lightness and strength of the timber it is highly esteemed for planking, boxes, packing-cases, transport-poles and shafts, palanquins and furniture, for which latter purpose the Insein Jail in Burma has passed it as most suitable. Gamble says it is the chief furniture wood of Chittagong. It is also used in carriage-making, well-construction, carving, canoes, dugouts, combs, toys, and is one of the most favoured woods used in India for tom-toms and drums. Tree-calipers made of this timber were used by the Working-Plans party in Kanara and found most suitable for that purpose, being both durable and light, *Outturn and prices.*—The outturn of this excellent timber is now limited, though still fairly common in Chittagong and Burma, where fair supplies could be procured. In this connection it is stated in the Administration Report of Burma for 1907-08, Pegu Circle, that steps are being taken to ensure a sustained supply. From the Central Provinces and the Deccan no large supply may be anticipated, though small quantities of the timber are usually obtainable in the local markets. Its price on the West Coast in Kanara is from Rs. 28 to Rs. 32 per ton.

Enquiries and references.—Enquiries for this timber should be made of the Chief Conservator of Forests, Maymyo, Burma; and of Central Provinces, Nagpur; of the Conservator of Forests, Eastern Circle, Eastern Bengal and Assam, Shillong; of the Conservators of Forests, Eastern and Western Circles, United Provinces, Naini Tal; of the Conservators of Forests, Central Circle, Poona. and Northern Circle, Bandra, Bombay Presidency; and of the Conservators of Forests, Central Circle, Madras, and Northern Circle, Waltair, Madras Presidency.

Minor products.—None of importance.

41. *Grewia tiliæfolia*, Vahl. (The Dhamni or Dhamin tree.)

Distribution.—A moderate to large tree, found in the South-Himalayan tract, from the Jumna to Nepal, throughout Central and Southern India. Very common on and above the Western Ghats in North Kanara, where it grows to 6 feet girth and over, but is rarely found sound over 5 feet in girth.

Quality of the wood.—The heart-wood is red-brown in colour, close-grained, hard, very elastic, smooth, taking a fair polish, easily worked, and seasons very fairly well. Its weight is approximately 50 lbs. per cubic foot, and the co-efficient of transverse strength, according to Talbot, is 5·2 tons per square inch.

Uses.—The timber is well adapted for all such purposes where elasticity and strength are essential. Thus, it is used for shafts, shoulder-poles, golf-clubs, tool-handles, oars, masts and agricultural implements. It is also used for door-posts, window-frames, furniture and bedsteads. Troup states that it is excellent for beer-casks, and that one well-known firm of brewers reported that if it could be supplied in large quantities it would supplant English oaks for that purpose.

Outturn and prices.—The outturn from North Kanara may be put at 100 to 150 logs of 5 feet girth and over per annum, containing ½ to ¾ of a ton each, the price on the coast being Rs. 30 to Rs. 40 per ton. In other localities similarly small quantities of this timber are available.

Enquiries and references.—Enquiries for this timber should be made of the Chief Conservator of Forests, Central Provinces, Nagpur ; of the Conservators of Forests, Eastern and Western Circles, United Provinces, Naini Tal ; of the Conservators of Forests, Central Circle, Poona, and Southern Circle, Belgaum, Bombay Presidency ; and of the Conservators of Forests, Southern Circle, Coimbatore, and Central Circle, Madras, Madras Presidency.

Minor products.—With the exception of the bast, yielding a fair fibre used for rope-making (for further reference to which see page 115), the minor products obtained from this tree are unimportant.

42. *Hardwickia binata*, Roxb. (The Anjan tree.)

Distribution.—This beautiful and graceful tree is found growing locally, grouped in dense masses, often forming belts of forests of its own, though in places it is also found mixed with other species Its chief habitats in Central India are in the Chanda, Hoshangabad and Nimar Divisions, the Berars, Khandesh Satpuras, and the Nasik, Belgaum and Dharwar Districts. It is again found further south in the Godaveri, Anantapur, Kistna, Bellary, Salem, North Arcot, Cuddapah and Coimbatore Districts. It grows in favourable localities to a large size, 6 to 8 feet in girth, with a clean bole, 30 to 40 feet in length.

Quality of the wood.—The wood is dark red-brown in colour, streaked with black bands, very hard and extremely durable. Gamble says that sleepers buried for seven years, when taken up were perfectly sound in every respect. The wood is cross-grained, and though it splits with no great difficulty when struck tangentially, it is extremely difficult to split it if struck on a radial section. As an example illustrating the latter point, a specimen piece was placed in the splitting machine at Dehra Dun, and 500 strokes on a radial cut failed to cleave it. This was without doubt due to the twisted fibre. The timber seasons with difficulty, and is subject to fine cup and heart-shakes. It is an extremely heavy wood, in fact one of the heaviest of our Indian timbers ; its weight is 82 lbs. per cubic foot, and therefore nearly double the weight of teak. Its transverse strength, according to Skinner, is 7·57 tons per square inch.

Uses.—The timber is used for beams, posts and bridge-construction Large beams, probably of great age, are to be seen in old forts in Khandesh and in the Holkar State. It is also used in rough carving for the ornamentation of temples. It has been used on the Holkar-Neemuch line for sleepers (Gamble), and would be most useful for this purpose were it not so difficult to saw. The timber is also used for bearings of machinery, all parts of the wheels of native carts, turnery work, hand-looms in the Central Provinces, clod-crushers and other agricultural implements, well-construction and carving. Troup suggests its use for paving-blocks, for which purpose it would appear most suitable.

Outturn and prices.—In the South Chanda Division of the Central Provinces, especially in the Sironcha Range, large quantities of this timber are available. The estimated annual outturn from the Ahiri Zemindari forests of the same division is 10,000 to 15,000 cubic feet of logs squaring to 16″. Rs. 1-10 per cubic foot is about the price of the wood landed at Warora station. Mr. Bell, Divisional Forest Officer, Nimar, states that "Anjan of a size suitable for timber, only occurs in a strip of broken and hilly country bordering the Nerbudda, extending to the extreme north-east of his District and forming the Punara and Chandgarh Ranges. Anjan here attains a considerable size trees 80 feet high and with a girth of 6 to 8 feet being not uncommon, The outturn, which will probably vary little for the next ten years, is estimated at 550 trees, yielding 8,250 cubic feet, from the Chandgarh Range and 450 trees, yielding 6,750 cubic feet, from the Punara Range, or a total of 15,000 cubic feet, annually."

The timber is sold either in the forests or in the markets of Punara and Sulgaon, the rates being as follows :—

In forest	"Lats"	(16′×30″)	=Rs.	3	each	or	0	5	6	per c. ft.
In Punara	,,	,,	=Rs.	4	,,	,,	0	7	4	,,
In Sulgaon	,,	,,	=Rs.	7	,,	,,	0	12	10	,,
In forest	"Kalias"	(10′×21″)	=Rs.	1 8	,,	,,	0	9	3	,,
In Punara	,,	,,	=Rs.	1 12	,,	,,	0	10	9	,,
In Sulgaon	,,	,,	=Rs.	2 0	,,	,,	0	12	4	,,

The delivery of the logs from the abovementioned forests to Jubbulpore, exclusive of royalty, is put at Re. 1-6-0 per cubic foot.

In Madras, in the Acha forests of the Salem District, Anjan is fairly plentiful, and it is estimated that it could be landed, including royalty, in Madras at about Rs. 2 per cubic foot and in Jubbulpore at Rs. 2-8 per cubic foot. Large trees are reported by Mr. Peake to occur in the Anantapur, North Arcot, and Cuddapah Divisions of the same presidency.

Enquiries and references.—Enquiries for this timber should be made of the Chief Conservator of Forests, Central Provinces, Nagpur; and the Conservators of Forests, Central Circle, Poona, and Southern Circle, Belgaum, Bombay Presidency; and of the Conservators of Forests, Central Circle, Madras, and Northern Circle, Waltair, Madras Presidency

Minor products.—For reference to the use of the bast fibre of this tree, see page 114.

The leaves of this tree are extensively eaten by cattle, goats, sheep and horses.

43. *Heritiera minor*, Roxb. (The Sundri tree.)

Distribution.—A moderate-sized evergreen tree with buttressed stem, found in the Sunderbans, in the Irrawaddy Delta, and on the coast of Tenasserim and Arakan Gamble, quoting Schlich, states that the tree grows to 60 feet in height and 6 feet girth.

Quality of the wood.—The heart-wood is dark-red in colour, very hard and close-grained, tough and very durable. Its weight is 68 to 70 lbs. per cubic foot and the co-efficient of transverse strength from 7 to 9 tons per square inch. It is therefore one of the strongest of Indian timbers. Its strength, toughness, elasticity and fine colour combined make it an extremely valuable timber, so much so that Gamble says that "the Sundri forests of the Sunderbans are among the most valuable of the Government forest properties in India."

Uses.—The chief uses of this timber are for boat-building, for which it is extensively used in Calcutta. It is also used for beams, planking, posts, spars, buggy-shafts, wheels of carriages, furniture, and wherever strength and elasticity are essential.

Outturn and prices.—The Sunderban forests must have been considerably denuded of large trees since Schlich and Home wrote on them in the seventies, for the late Conservator of Bengal, Mr. Hart, in a letter states that practically no sound Sundri timber over 3 feet in girth is now available. On the other hand the present supply of middle-sized logs is still very large, for in 1908-09 the outturn of this timber from Bengal was 949,000 cubic feet. The Conservator gives the present rates for timber of 2 to 3 feet girth, standing in the forest, as Rs. 175 per 500 maunds of 875 cubic feet, and that the cost of cutting and transporting that quantity to Calcutta would be about Rs. 100.

Mr. Lace, the Chief Conservator of Burma, states that considerable quantities of this timber would be available from the Coast forests of

Tenasserim, and that large trees exist in those forests for which there is at present only a small local demand.

Enquiries and references.—Enquiries for this timber should be made of the Chief Conservator of Forests, Burma, Maymyo; and of the Conservator of Forests, Bengal, Darjeeling.

Minor products.—Nil.

44. *Holarrhena antidysenterica*, Wall. (The Kura or Dhudi tree.)

Distribution.—A small deciduous tree, found throughout India and Burma, and of great importance both for the value of the timber and also from a sylvicultural point of view.

Quality of the wood.—The wood is white, soft, even-grained, easily worked, taking a very smooth surface and good polish. Its weight is about 40 lbs. to the cubic foot, and its maximum transverse strength is recorded by Gamble as being 4·52 tons to the square inch.

Uses.—The timber is universally used in India in the manufacture of toys, wooden spoons, forks, plates, combs, paper-knives, rulers, ornaments, bead-necklaces, carved picture-frames, tables and similar articles. It is also used for carving and turnery work, especially in the Saharanpur and Bijnor Districts.

Outturn and prices.—The tree does not grow to a great size, so that large logs are not procurable, nor are they wanted for the purposes for which the timber is required. With the exception of districts containing either evergreen or coniferous and oak forests, nearly all other districts where deciduous forests occur can supply a fair quantity of this valuable timber. It can also be procured in most timber centres, especially if previous notice is given that purchasers are in quest of the wood. The price of the wood varies in different parts of India, rarely exceeding 8 annas a cubic foot.

Enquiries and references.—Enquiries for this timber should be made of any of the Conservators of Forests or local Divisional Forest Officers.

Minor products.—For reference to the use of the bark, see page 144.

45. *Holoptelea integrifolia*, Planch.

Distribution.—A large deciduous tree, generally found scattered in the deciduous forests of the sub-Himalayas from Kashmir to Nepal ascending to 2,000 feet, throughout the Peninsula; uncommon in the Western Ghats, Upper Burma and dry regions of Ceylon.

Quality of the wood.—The wood is light-yellow to grey in colour, moderately hard, easily worked to a smooth surface, seasons well, somewhat cross-grained if cut radially; weight about 40 lbs. per cubic foot; co-efficient of transverse strength under 4 tons to the square inch.

Uses.—The timber has not been extensively used in the past, except to a limited extent for carving, cart and building purposes. It is suitable for match-sticks and match-boxes (Roller). A Cawnpore firm have pronounced it very suitable for handles of dusting brushes, and write that it appears to them to be a very excellent wood for this purpose, as good as the English elm.

Outturn and prices.—A fair outturn may be expected of this timber, as the tree has not been largely exploited in the past. It could best be procured from the wood contractors who fell the annual compartments, as it is generally exploited together with other trees.

Enquiries and references.—Persons requiring this wood should apply to the local Divisional Officers and to the local timber merchants.

Minor products.—None of importance.

46. *Homalium tomentosum*, Benth. (The Myaukchaw tree of Burma of Moulmein Lancewood.)

Distribution.—A large deciduous tree, chiefly found in Burma and to a less extent in Chittagong valleys and in Ganjam. It grows to a great size in Burma, with straight clean boles, 70 feet in length.

Quality of the wood.—Heart-wood brown to dark-brown, hard, durable, cross-grained, elastic, heavy, weighing 55 to 60 lbs. per cubic foot. Brandis, quoted by Gamble, gives the transverse strength of two tests as 6·98 and 7·07 tons per square inch. The difficulty is in seasoning this valuable timber sufficiently slowly to prevent it splitting. This difficulty might be overcome by applying some substance, such as "Ligno," to the end of the logs before removing the bark and so retard the seasoning process.

Uses.—The strength and elasticity of this timber render it suitable for shafts of timber carts. Samples of this timber were sent to a well-known firm of fishing-rod manufacturers in England, who reported on it as follows:—

> "It is a promising wood for fishing-rods, but the specimen sent was badly shaken throughout."

It is also used for harrow-teeth, furniture, rice-cleaning machines, and masts. The tree yields most excellent fuel and is largely used in Rangoon for this purpose.

Outturn and prices.—Fairly large supplies of this timber can be procured in Chittagong and Burma, where the tree is common, and found growing to a large size It is exported to Rangoon both as fuel and timber. When cut into billets it fetches Rs. 23 per 100 cubic feet stacked. Its price in Rangoon as timber is about Rs. 15 per ton.

Enquiries and references.—Enquiries for this timber should be made of the Chief Conservator of Forests, Burma, Maymyo; of the Conservator of Forests, Eastern Circle, Eastern Bengal and Assam, Shillong; and of the Conservator of Forests, Northern Circle, Madras, Waltair.

Minor products.—Nil.

47. *Hopea odorata*, Roxb. (The Thingan tree of Burma or Rimda tree of the Andamans)

Distribution.—A large evergreen tree, found in the moist forests of Tenasserim, Pegu and the Andamans.

Quality of the wood.—The wood is yellow in colour, with very handsome close and even grain; it is very durable. In this connection Gamble says that specimens brought from Tavoy, and 50 years old, were perfectly sound, also that boats made of this wood last for 20 years. It weighs 48 lbs. to the cubic foot, and the transverse strength, according to Everett, is 7·99 tons to the square inch. It is therefore even stronger than teak. It is said to withstand the attacks of white-ants.

Uses.—The timber is extensively used in South Tenasserim for building purposes, bridge construction, carriage-building, especially for all parts of the wheels. It is also used for furniture, shingles, and gunstocks. Troup suggests its use for paving-blocks It would also do for sleepers, having been used for this purpose on the forest tramways in the Andamans. Being a strong timber, light in weight, and of good appearance, it deserves the attention of timber merchants, especially of those in Calcutta, who could procure it at no great expense from Burma or the Andamans.

Outturn and prices.—Large logs of this timber are procu able from the Andamans, squaring up to 40 feet in length and a 2 feet side, the price being from Rs. 40 to Rs. 50 per ton.

Enquiries.—Enquiries regarding this timber should be made of the Conservator of Forests, Tenasserim Circle, Rangoon; and from the Deputy Conservator of Forests, Port Blair, Andamans.

Minor products.—For a special note on the resin obtained from this tree, see page 139.

48. *Hopea parviflora*, Bedd. (The Irumbogam tree of Malabar.)

Distribution.—A very striking evergreen tree, first appearing in South Kanara, and extending southwards down the Malabar Coast into Tinnevelly. It is generally found in the moist evergreen forests along the foot of the Ghats. It grows to a large tree in favourable localities, with a clean straight stem, 30 to 35 feet long and more, yielding logs of over 50 cubic feet.

Quality of the wood.—The wood is brown in colour, close-grained, hard, durable, of good appearance, weighing 54 to 62 lbs. per cubic foot; not unlike Sal timber, but smoother and finer-grained. It is an excellent timber and much prized locally. It deserves wider recognition, being little known outside its own habitat. There should be an opening for this valuable timber in the Bombay market, as export by sea from Malabar is easy and cheap.

Uses.—The wood is used in house-building and in the construction of temples on the West Coast, for ship-building in all its parts, as also for bridge-construction, and in all places where durability and strength are a desideratum and where weight is of minor consequence. It might be tried for paving blocks, and has been tried for sleepers in Madras with considerable success.

Outturn and prices.—The total outturn from all classes of forests in Madras Presidency in 1907-08 was 62,996 cubic feet and in 1908-09 55,755 cubic feet. The amount which it will probably be possible to procure in future will sooner increase than decrease, as the forests containing this species are brought under regular management. The price of the timber in the log varies between Re. 1-4 to Rs. 2-0 per cubic foot on the coast.

Mr. Brown, of the Malabar Saw Mills, puts the quantity annually available at Kallai, near Calicut, at 1,250 tons, and the price of scantlings at Rs. 2-8-6 per cubic foot and of planks at Rs. 2-10-6 per cubic foot.

Enquiries.—Enquiries for this timber should be made of the Conservator of Forests, Southern Circle, Madras, Coimbatore.

Minor products.—Nil.

49. *Juglans regia*, Linn. (The Indian Walnut.)

Distribution.—A large deciduous tree, found in the North-Western Himalayas at 3,000 to 10,000 feet elevation, extending from Bhutan westwards into Kashmir, Afghanistan and on into Persia and Armenia. It is also found in the hills of Upper Burma. It is extensively cultivated in the Himalayas. It is a most valuable tree both on account of its timber, as well as for its fruit and the oil expressed from the fruit. It grows to a great size in India, trees of 80 to 100 feet high, with boles of 8 to 10 feet girth and 30 to 40 feet in length are by no means uncommon.

Quality of the wood.—The wood is grey-brown in colour, marked with darker streaks, giving it a strikingly handsome appearance. It is moderately hard, does not split, is easily worked and takes a fine polish. Its weight is about 38 to 40 lbs. per cubic foot, and it is, therefore, a comparatively light wood.

Uses.—Walnut timber is well known on the English market, being extensively used by furniture makers. Gamble says that it is perhaps the most valuable of the Himalayan woods for this purpose. It is also used in lacquer-work, for gun-stocks, carving, mouldings, spinning wheels, pipes and a variety of minor purposes.

The "burrs," which grow on these trees, are extremely valuable for veneering work. Sample "burrs" were recently sent from the Punjab to the Universal Hardwood Association, London, who reported on them as follows :—

> "Generally speaking their appearance betrays little superficial difference from the burrs received from the Caucasian or Persian districts. Judging from the flat side, after adzing, one "burr" shows slight signs of worms. The colour is mixed, the brown and light-clayish dominating the dark portions, an in-bark also penetrates, which is a disadvantage. In other respects we think that these burrs are merchantable from actual appearance."

Outturn and prices.—The possible number of mature trees in the Punjab is estimated to be as follows —

Bushahr Division.—2,500 to 3,000 trees over 6 feet girth.

Hazara Division —16,000 mature trees.

Kulu Division.—The number is not given, but it is thought to be considerable.

The value of trees of 6′ girth when "burrs" are not present is about Rs. 25 each, standing in the forest. It is estimated that it would cost from Re. 1 to Re. 1-8 per cubic foot to land the timber in Abbottabad. In the case of trees containing "burrs" their average value may be taken at Rs. 100 in the forest.

Mr. Lovegrove, Conservator of Forests, Kashmir, states that walnut trees are very common in Kashmir, both in the village lands and demarcated forests, and that in 1906-07 trees were sold standing for about Rs. 15 each. In the next year trees were sold for Rs. 25 each in the Muzaffarabad Division, and in the following year the price of two small lots went as high as Rs. 670 and Rs. 225, respectively, per tree. In 1910 three lots were sold for Rs. 197-8, Rs. 355, and Rs. 266 per tree. The Conservator states that this is a gamble, and that few trees will probably be removed. In all cases the purchaser selects his own trees, as it is the burr only that is required. He goes on to say that a tree producing about 2½ maunds of burrs is at present worth about Rs. 100 to Rs. 120 standing.

The value of the wood on the English market is about 2*d.* to 3½*d.* per square foot for boards, and 4*s.* 6*d.* per cubic foot for planks.

The possible outturn of burrs in the Punjab has not yet been accurately estimated, but the Divisional Forest Officer, Hazara, thinks it is fairly large. The price of burrs on the English market varies enormously according to colour, figuring, number of the eyes and size of the burrs, the essential qualities being a dark colour, even and close distribution of the eyes and absence of in-wood. Burrs fetch in Europe, ex-ship, anything from £12 to £120 per ton, according to quality

Enquiries and references.—Enquiries for the timber and ' burrs" of this species should be made of the Conservator of Forests Punjab, Lahore ; and of the Conservator of Forests, Jammu and Kashmir State.

Minor products.—For reference to the nuts, see page 147.

50. *Lagerströmia Flos-Reginæ*, Retz. (The Taman tree of India or Pyinma tree of Burma.)

Distribution.—A large deciduous tree of Assam, Eastern Bengal, Chittagong, Burma, North and South Kanara, the Malabar Coast, in which localities it is common, in the Circars and Chota Nagpur it is scarce Cultivated in many parts of India as an ornamental tree, which when in flower is very beautiful. Plantations of this tree have also been made, chiefly in Assam. The tree is generally found growing near or along river banks, lakes, and in swampy localities. It grows to an enormous girth though the length of the bole up to the first branch rarely exceeds 20 to 30 feet.

Quality of the wood.—This tree yields a most excellent timber, being one of the important timber trees of Assam, Eastern Bengal, Chittagong and Burma. In colour it is light red, being brighter when freshly cut than in a seasoned state; hard, durable, smooth, works easily, and takes a good polish; lasts well under water, and able to stand rough wear and tear. Its weight is 40 lbs per cubic foot and the transverse strength of two tests gave 5·22 tons per square inch.

Uses—The excellent qualities of this timber render it useful for many purposes. It is used for house-building, carts, bridge-construction, all parts of boats, such as keels, masts, spars and paddles, well construction, furniture-making, gun-stocks, and wherever strength and durability together with lightness, are demanded. The timber has been recommended for carriage-building in England. Troup says it is sometimes used in Burma in coopers' work, and Beddome also mentions it as being used in Ceylon for this purpose

Outturn and prices.—The outturn from Assam is considerable, especially from the more remote Divisions, where fellings have been less severe in past years. The timber is exported to Bengal; for instance, about 20,000 cubic feet are exported yearly in the log from the Sylhet Division (Ledger Report of 1897). In other Assam Divisions the supply is consumed locally. Prome Division in Burma can supply at least 200 tons yearly, and many other Burma Divisions similar quantities. From North and South Kanara and the Malabar Divisions, where the tree is not so common, only limited supplies of 20 to 40 tons could be procured annually from each locality. In the Ledger Report abovementioned, the selling price in Sylhet district is given as Re. 1 to Rs. 2 per cubic foot. In Lakhimpur planks 15′×1″×18″ sell for Re. 1-4 to Re. 1-8 each. The Divisional Forest Officer, Prome in Burma, gives the price as Rs. 18 to Rs. 20 per ton in the rough.

Enquiries—Enquiries for this timber should be made of the Chief Conservators of Forests, Burma, Maymyo, and Central Provinces, Nagpur; of the Conservators of Forests, Eastern and Western Circles, Eastern Bengal and Assam; of the Conservator of Forests, Southern Circle, Bombay, Belgaum; and of the Conservator of Forests, Southern Circle, Madras, Coimbatore.

Minor products.—Nil.

51. *Lagerströmia lanceolata*, Wall. (The Nana or Benteak of the West Coast.)

Distribution.—A very large, cylindrical-stemmed tree of North and South Kanara, extending southwards into Malabar and Travancore. It grows to a great size in favourable localities, attaining a height of 100 feet and over with a girth of 8 and 10 feet and a clean bole of 50 to 60 feet in length.

Quality of the wood.—This tree yields one of the best timbers of the West Coast. It is of dull red-brown colour, straight-grained, moderately hard, very elastic and tough, durable, especially in salt-water, weight 45 lbs. to the cubic foot and, therefore, about equal to teak. Its co-efficient of transverse strength is 4·61 tons per square inch according to two tests recently carried out at Sibpur It is liable to split if not carefully seasoned.

Uses.—The timber is in great demand on the West Coast for ship building Nearly all the best native crafts plying up to Bombay and the Persian Gulf are made either of this timber or of teak. Fancy prices are paid for good mast-poles of this timber. A regular supply is sold to the Madras and Southern Marhatta Railway, chiefly for planking and rafters for construction work. It is used locally for building, bridging, cart-construction, agricultural implements, coffee-cases and furniture.

Outturn and prices.—The possible outturn is considerable, while large logs from 1 to 2½ tons are obtainable. In the West Division of the Northern Kanara Collectorate, 18,315 trees over 6 feet girth were enumerated in one valley only The Working-Plans in the four Forest Divisions of North Kanara fix the total number of trees, of over 7 feet girth, to be felled annually at 2,904, yielding about 3,000 tons. The price of this timber on the coast at Karwar is from Rs. 40 to Rs. 64 per ton, while in the Ghat depôts it is less, as the cost of exporting the timber outside the district is greater.

In the South Kanara and Malabar districts the supply is nearly equal to that of North Kanara, while the tree is also common in the Tinnevelly District.

Mr. Brown, of the Malabar Saw Mills, puts the possible annual amount available at Kallai, Calicut, at 2,500 tons and the price of scantlings at Rs. 1-15-6 per cubic foot, and of planks at Rs. 2-1-6 per cubic foot, *Enquiries.*—Enquiries for this timber should be sent to the Conservator of Forests, Southern Circle, Bombay Presidency, Belgaum ; and to the Conservator of Forests, Southern Circle, Madras Presidency, Coimbatore.

Minor products.—Nil.

52 *Lagerströmia parviflora,* Roxb. (Dhaura or Bondarah.)

Distribution.—A large deciduous tree, found all over India, except in very dry localities, scarcer in the south of the Peninsula. It is found as a large tree in the sub-Himalayan forests, as a moderate-sized tree in Central India, Khandesh and the Deccan, and as a small tree of 3 feet girth and 40 to 50 feet in height in Guzarat. It is an important species, both for the good quality of the timber which it yields as also for sylvicultural reasons.

Quality of the wood.—The wood is grey-brown in colour, very hard, cutting to a smooth shiny surface, durable and not readily attacked by white-ants. The timber is difficult to work, and rather liable to split. Its durability is shown by the fact that it is in great demand by villagers for posts to be placed in the ground in the construction of their houses ; in this state it is said to last far longer than most other timbers. It is a moderately heavy timber, weighing 53 lbs. per cubic foot.

Uses.—The timber is used in all parts of house-construction, except planks, for cart-shafts, spokes, axles and felloes of wheels, for boats, tool-handles, agricultural implements, and to a limited extent as sleepers. A trial was given to this timber by the Opium Agent, Behar, who reported on it as follows :—

> " Wood rather heavy, but chests keep in good condition. It shrank a little more than Keora (*Sonneratia apetala*), but otherwise compares very favourably with that wood."

It produces an excellent fuel.

Outturn and prices.—The possible outturn is considerable, as it is not an uncommon tree in most deciduous forests, though in some cases the cost of extraction is considerable, the tree being sometimes thinly scattered over large areas.

As an example of the possible outturn from any one locality, the Divisional Forest Officer, Goalpara, estimates the annual output of this timber at 30,000 sleepers.

Minor products.—The bast yields a coarse fibre, which is made into ropes; otherwise the minor products yielded by this tree are unimportant.

53. *Mangifera indica*, Linn. (The Mango tree.)

Distribution.—A large evergreen tree, found wild and cultivated all over India and Burma. Brandis says it is indigenous in Burma, the Western Ghats, in the Khasia Hills, Sikkim and in the ravines of the Satpuras. There is some doubt as to whether it is wild in the Western Satpuras; it is true it occurs in that locality up the ravines, but from its local distribution, generally near recognized Bhil halting-grounds, and old settlements, the question is open to doubt. The popular conception of the mango tree is that it is broad-crowned, with a large, rather short stem. When found in the moist deciduous or evergreen forests of Kanara and Malabar, such a description would be incorrect. It is there often found as a tall tree, with a long straight stem of 10 and 12 feet girth, 50 to 60 feet to the first branch, and with a comparatively small crown.

Quality of the wood.—The wood is grey-brown to dark-brown in colour, streaked with darker coloured tissue, hard, durable and lasts well in water. Dugouts made of it last 12 years and more. It seasons well and does not warp or shrink when jointed. It is not a handsome timber, being somewhat coarse and twisted in the fibre. Weight is 42 lbs. per cubic foot, and its co-efficient of transverse strength between 3·2 and 5·2 tons per square inch.

Uses.—The timber is of considerable value, being extensively used for building purposes in the shape of beams, rafters and planks; about 50,000 opium-chests are made annually of this timber in Behar It is also used in Dehra Dun for tea-boxes and elsewhere for packing-cases. On the West Coast and in Madras the timber is highly prized for dugouts, it being one of the most sought after species for this purpose. Boats and ships are also made of this timber, its other uses being for agricultural implements, carts, wheels, and coopers' work.

Outturn and prices.—Owing to the demand for this species, the mature trees in many parts of the country are fast disappearing, and though the tree is extensively cultivated, the yield of big trees in the near future must necessarily be limited. On the West Coast there are still considerable supplies. The price varies from 10 annas to Re. 1-4-0 per cubic foot, according to the demand and possible supply.

Enquiries.—Enquiries for this timber should be made in the local timber markets, when not in the neighbourhood of forest areas, as the supply from cultivated lands is considerable. In the vicinity of forest areas they may be made of the Conservators of Forests, Punjab, Lahore; Bengal, Darjeeling; Eastern and Western Circles, Eastern Bengal and Assam, Shillong; Eastern and Western Circles, United Provinces, Naini Tal; Central Circle, Poona, Southern Circle, Belgaum, Northern Circle, Bandra, in the Bombay Presidency; Northern Circle, Waltair, Central Circle, Madras, and Southern Circle, Coimbatore, Madras Presidency; and the Chief Conservator of Forests, Central Provinces, Nagpur.

Minor products.—For reference to the fruit of this tree, see page 147.

54. *Melia indica*, Brandis. (The Neem tree.)

Distribution.—It is doubtful if this tree is ever found in a wild state and though found in the forests nearly all over India, it has generally been sown or planted or sown itself from cultivated trees. It has been universally planted as a road-side tree and near village sites. Though the timber is only moderately good, nearly every part of this tree is used by natives for one purpose or another.

Quality of the wood.—The sap-wood is grey, the heart-wood dull-red in colour, fairly hard and durable, close-grained and slightly scented. Its weight is 50 lbs. per cubic foot and the co-efficient of transverse strength, according to Unwin, is from 2·55 to 5·125 tons to the square inch.

Uses.—The timber is used in the construction of the poorer class of native houses for posts, beams and rafters, for carts and cart-wheels, ploughs, oil-mills, furniture-making, ship-building and carved Hindu idols (Gamble).

Outturn and prices.—The timber of this well-known tree does not often come on the market in large quantities, and the supply is irregular. The price of the timber is not known, as it must depend entirely on local conditions; it can, however, rarely exceed 4 annas per cubic foot.

Enquiries.—All enquiries for the timber should be made of local Divisional Forest Officers and contractors.

Minor products.—For information as to the uses of the seed, see page 128.

The leaves of this tree are used for driving ants out of houses, by spreading them round the infected places, and the bark is sometimes used in native medicine.

55. *Mesua ferrea*, Linn. (The Nahor tree of Assam.)

Distribution.—A large straight-stemmed tree, found in the evergreen forests of Assam, especially in the Charduar and Nambar forests, Khasia Hills, Chittagong, the Ghat forests of the West Coast, more common in Malabar than in Kanara, in Tenasserim, Upper Burma and in the Andamans. It has been largely cultivated in Burma, chiefly round Buddhist monasteries and on tank-bunds. It grows to a great size in Assam, Burma, in the Honawar Range in North Kanara and in the Malabar District, while in the Andamans, Gamble says, logs square up to 60 feet in length and 2 feet siding.

Quality of the wood.—The wood is dark-red in colour, extremely hard and heavy. As regards its durability, the Tezpur-Balipara Railway state that the sleepers that were put down were quite sound after four years' trial. The Engineers of the above railway, as also of the Assam-Bengal Railway, state that the wood is not attacked by white-ants, though they say that it is liable to crack. The sleepers of this timber put down as an experiment in 1900 by the Madras Railway, were all sound in 1904. Troup says it should not be used unless well seasoned, otherwise it is liable to warp and split. It is difficult to work, owing to its weight and hardness It weighs about 70 lbs. per cubic foot, and is therefore equal in that respect to ebony or Anjan, while its co-efficient of transverse strength is as high as 8 tons per square inch.

Uses.—Sleepers of this timber are in use on the Dibru-Sadiya, Assam-Bengal, and Tezpur-Balipara Railways, and trials have been made with it on the Madras lines. It is also used for building purposes for beams and posts, but not for planking, in bridge construction, piers, jetties, for carts, agricultural implements, gun-stocks, masts, helms and tool-handles. Troup says it has been used on Burma Railways for ballast wagons with some success, though it has been reported to warp badly. The Chief Engineer, South Indian Railway, thinks that this timber deserves further trial.

Outturn and prices.—The supply from the Assam forests of the Eastern Circle is considerable, though no data are available as to the actual amount. It is also to be had in fair quantities in Burma, especially from the Tenasserim Circle, in Madras from Malabar, and from the Andamans. To illustrate the prices which are realized for this timber it may be stated that the Assam-Bengal Railway pay Re. 1-8 per cubic foot and the Dibru-Sadiya Railway Re. 1-5-4 per cubic foot for sleeper wood.

The amount available on the West Coast is not known, but is reported to be considerable. At Kallai, Calicut, scantlings sell for Rs. 2-1-0 and boards for Rs. 2-3-0 per cubic foot. The cost of shipping from Calicut to Bombay is Rs. 10 to Rs. 12 per ton.

Enquiries.—Enquiries for this timber should be made of the Chief Conservator of Forests, Burma, Maymyo; of the Conservator of Forests, Eastern Circle, Eastern Bengal and Assam, Shillong; of the Conservator of Forests, Southern Circle, Bombay, Belgaum; of the Conservator of Forests, Southern Circle, Coimbatore, Madras; and of the Deputy Conservator of Forests, Andaman Islands, Port Blair.

Minor products.—For reference to the oil expressed from the seed of this tree, see page 127.

56. *Mimusops Elengi*, Linn.

Distribution.—A large evergreen tree of Southern India, South Burma and the Andamans. It is found on the West Coast as a large tree in the evergreen forests, and as a smaller tree on the East Coast. It is a large tree in Martaban, Tenasserim and the Andamans. Much cultivated in many parts of India for its fruit.

Quality of the wood.—The wood is dark-red in colour, extremely hard, close-grained, cutting to a smooth surface, durable, difficult to work, but takes a good polish. Its weight is 60 lbs. per cubic foot and the coefficient of transverse strength, according to Everett, 10·38 tons per square inch; it is therefore one of the strongest of Indian timbers.

Uses.—The timber is used as beams and posts in house-construction; in Guzarat it is used for oil-mills by the Ghanshis, though Kosum timber is preferred. Gamble, quoting Graham Anderson, says it is used in preference to other woods for rice-pounds in Mysore. Troup says it is used for piles, carts, shafts, axles, naves of wheels, boats, cabinet-work and walking-sticks.

Outturn and prices.—Though not an uncommon tree, the timber is not generally found on the market as the tree is not often felled owing to the value of the flowers, fruit and bark. It is therefore practically impossible to state the outturn for any locality.

Enquiries—Enquiries for this timber should be made of the Chief Conservator of Forests, Burma, Maymyo; of the Conservators of Forests, Northern Circle, Waltair, Central Circle, Madras, Southern Circle, Coimbatore, in the Madras Presidency; of the Conservators of Forest

Southern Circle, Bombay, Belgaum, and Central Circle, Bombay, Poona; and of the Deputy Conservator of Forests, Andaman Islands, Port Blair.

Minor products.—The fruits of this tree are edible, the bark is used locally for tanning, and the seed produces an oil used for lighting and cooking.

57. *Odina Wodier*, Roxb. (The Jhingan or Mohin tree.)

Distribution.—One of the commonest trees in the hotter parts of India and Burma; also found in the Andamans In dry localities, such as Central India, Rajputana and the Deccan, it is found as a moderate-sized to small tree; in somewhat moister localities it grows to a large size, 50 to 60 feet in height, with a spreading crown and has not an unhandsome appearance. A tree measured in Guzarat was 45 feet high and 22 inches diameter, and this would be an average tree for that locality. In Ankola in North Kanara, which is a moist locality, records show trees of 8 feet in girth. In Burma the tree grows to 7 and 8 feet in girth with a clean bole of 30 feet

Quality of the wood.—In colour the sap-wood is grey-white, the heart-wood small, brick-red, turning darker on exposure, moderately hard, with a close though short fibre, cutting to a smooth even surface. In the moister localities, where the tree grows to a good size, the heart-wood is larger and of commercial value, but in very dry localities it rarely measures 6″ across, and is therefore of less value. The timber seasons well, does not warp, and is said to be immune to the attacks of white-ants. It is fairly durable under cover, but not so if exposed to excessive moisture. Its weight is 50 to 55 lbs. per cubic foot; tests for its co-efficient of strength vary enormously, ranging, according to Gamble, between 2·34 and 6·6 tons per square inch.

Though the timber is only of fair quality, it has in many localities obtained a somewhat disproportionate value in the eyes of the local communities, chiefly due to the fact that it is procurable where other far superior timbers are either uncommon or very expensive. It has in consequence been employed for many purposes for which it is not altogether suitable in default of better timber being obtainable. It may, therefore, under the circumstances be classed as a valuable and useful timber in certain localities.

Uses.—It is chiefly used for planks for doors and windows, spear-shafts, scabbards, agricultural implements such as tool-handles, clod-crushers, rollers, oil-presses, for cattle-yokes, wheel-spokes, posts for fences, carving and well-scoops, also in turnery work in the manufacture of bowls and jars. It is suitable for match-splints but not for boxes (Roller). Troup says it is also used for mining-props in the Mohpani colliery. It has been tried for sleepers but failed.

Outturn and prices.—The trees are generally exploited together with other species from the annual felling areas, fairly large quantities often being available. The Agricultural Ledger, No. 16 of 1900, gives examples of local prices of this timber. It states that in the Punjab the local price is Re. 1 per tree. In Kangra its value is put at 2 annas per cubic foot. In Madras the best prices are 3½ annas per cubic foot. In Pegu, Burma, it is said to be sold in lots with other woods for Rs. 600 to Rs. 1,000 per 100 logs of 6 feet girth and over. In most divisions in Burma there is no trade in this wood ; only in Mandalay some 50 tons are sold annually for Rs. 12-8-0 to Rs. 18 per ton. In the Bombay Presidency it fetches up to 2 annas per cubic foot. It is used as fuel in Guzarat.

Enquiries.—Enquiries for this timber should be made of any local Divisional Forest Officer, or better still, of local timber merchants.

Minor products.—For reference as to the use and value of the gum, see page 137.

58. *Ougeinia dalbergioides*, Benth. The Tinnas, Tewas or Sandan tree.)

Distribution.—A moderate-sized deciduous tree, found nearly all over India, very common, according to Gamble, in the hot valleys of the lower Himalayas up to 5,000 feet ; throughout Central India, the Satpuras, Deccan, and extending on the south to the Godavari, eastwards to Orissa and westwards into Guzarat. In very dry localities it is found as a small tree, often with a tendency to a cork-screw shaped stem. It grows to a large size in the Mungod and Supa Working Circles of North Kanara and in the Angul forests of Bengal where the tree attains a girth of 6 feet and over and 30 to 40 feet bole. In Orissa they are also reported to grow to this size, elsewhere 2½ to 4 feet girth may be taken as the average size of the tree.

Quality of the wood.—The colour of the wood is grey to grey-brown, mottled, handsome, close-grained, very elastic, tough and hard, especially in the case of slow-grown trees. It takes a good polish, seasons well, weight 55 to 60 lbs. per cubic foot, and the co-efficient of transverse strength, according to Talbot, is 6·71 tons per square inch, this being the average of six specimens. A piece 16″ × 4″ × 4″ of this timber recently tested for transverse strain at Sibpur sheared with a load of 16·8 tons instead of breaking. Both shearing and compression tests gave high results.

Uses.—The toughness and elasticity of this timber render it most suitable for shafts for carts, axles, naves, palanquin-poles, oars, axe and tool-handles. It is also used for furniture, agricultural implements, such as ploughs and yokes, tent-pegs, spinning-wheels (Madras) and well-construction.

Outturn and prices.—The outturn from the Deccan forests is restricted to poles and small logs in nearly every forest division in the Central Provinces, United Provinces and Deccan. This timber is felled together with other species, a moderate supply only being obtainable from each district. To illustrate the possible outturn and prices from localities for which information is available, and which has been furnished by the various Divisional Forest Officers, the following figures are given :—

Locality.	Amount available.	Size of trees or logs available.	Approximate value.
UNITED PROVINCES.			
Bahraich Division .	Not very common	3 to 4 feet girth	6 annas per cubic foot in forest, 15 annas per cubic foot at Bahraich station.
Gonda Division . .	Fairly common .	10 feet clear bole and 3 to 4 feet in girth.	8 annas per cubic foot in round, 12 annas per cubic foot roughly squared, Re. 1 per cubic foot on station.
Gorakhpur Division .	Fairly common, locally	10 to 12 feet clear bole, 3 to 4 feet girth.	8 to 10 annas per cubic foot in forest, about 13 annas per cubic foot on rail.
Bundelkhand Division	Fairly common in places.	20 feet clear bole, 3 feet girth.	2 annas to Re. 1 per pole (balli) according to size.
Kheri Division . .	Fairly abundant .	4½ feet girth . .	Billets 3 feet girth and 3 feet long sell readily for 12 annas to Re. 1 each on rail. Royalty for billets 3 feet long and under 30" girth 2 annas each, over 30" girth 4 annas each.
BENGAL.			
Angul Division .	A fairly large number of trees of this species are to be found in the Angul forests.	A large tree up to 5 to 7 feet girth, 4½ feet girth being the minimum cutting size, yielding logs up to 25 cubic feet.	8 to 12 annas per cubic foot in forest and 14 annas per cubic foot on rail.
Chaibassa Division .	Found in fair abundance.	20 feet clear bole and 4 feet girth.	Possible yield 2,000 cubic feet per annum. Prices Re. 1-4 per cubic foot and cost of extraction to rail 8 to 12 annas per cubic foot.

Locality.	Amount available	Size of trees or logs available.	Approximate value.
CENTRAL PROVINCES.			
Melghat Division	Fairly common, 5% of the growing stock, demand good.	2½ feet girth, 15 feet clear bole.	In lengths of 15 feet. 10″–14″ .4 annas each. 14″–18″ 10 ,, ,, 18″–22″ Re. 1 ,, 22″–26″ Re. 1-12 ,, 26″–30″ Rs 2-12 ,, 30″–34″. Rs. 4 ,, In lengths of 8 feet half price. Rs 15 per cart-load of 6 maunds at Elichpur and Rs. 18 at Itarsi, on rail (1 maund = 82 lbs.).
Buldana Division	Not very abundant, most common in Ambalawa forest.	2 feet girth and 12 to 15 feet bole.	Rs 6 per cart load of 16 cubic feet is the local price.
Betul Division	Common throughout the district, forming as much as 20% of the crop in some forests The estimated outturn is put at 6,000 cubic feet per annum.	3½ feet girth and 14 feet bole.	4,936 cubic feet sold for Rs 676 or slightly over 2 annas per cubic foot, in the forests The Conservator, Mr. Rogers, remarks that it is as valuable as teak in Betul Division
BOMBAY.			
Central Circle, Khandesh and Nasik Divisions.	A fair amount of the timber is available from Khandesh and Nasik Divisions	3 to 4 feet girth and 15 feet clear bole.	6 to 8 annas per cubic foot in the forests
Northern Circle, Surat and Thana Divisions.	In the Surat Dangs and Mandvi forests, it is a fairly common tree.	4 feet girth, 20 feet bole.	In the Dangs 2 to 3 annas per cubic foot.
	In Thana District fairly common in places only.	10 to 20 feet bole and 3 to 5 feet girth.	Price on rail or in depôts Rs. 3 to Rs. 4 per kandi of 784 lbs.
Southern Circle, Eastern and Northern Divisions.	Common in the Supa and Mungod forests of North Kanara, found as a large tree	6 feet girth and 30 feet clear bole	Price in forest 8 to 12 annas per cubic foot Possible outturn 3,000 cubic feet and more.
MADRAS.			
Ganjam Division	Scarce	4 feet girth and 20 feet clear bole.	8 annas per cubic foot in forest.

Enquiries.—Enquiries for this timber should be made of the Conservators of Forests, Punjab, Lahore; Eastern and Western Circles, United Provinces, Naini Tal; the Chief Conservator of Forests, Central Provinces, Nagpur; the Conservator of Forests, Bengal, Darjeeling; the Conservators of Forests, Central Circle, Poona, Northern Circle, Bandra, and Southern Circle, Belgaum of the Bombay Presidency; and of the Conservators of Forests, Southern Circle, Coimbatore, and Northern Circle, Waltair, Madras Presidency.

Minor products.—With the exception of the bast fibre and a red gum of little value, the tree yields no minor products.

59. *Picea Morinda,* Link. (The Himalayan Spruce.)

Distribution.—A lofty straight-stemmed tree of the Himalayas, extending from Bhutan to Afghanistan at 7-11,000 feet elevation. This very fine tree grows to an enormous height and attains a great girth. Troup records a tree near Konain, in Jaunsar, of 200 feet in height and 24 feet girth; nor is this altogether uncommon, for many trees are to be found in these forests of 160 to 180 feet height and 12 feet and over in girth.

Quality of the wood.—The wood is white to white-grey in colour, soft to moderately hard, and very similar to the European spruce in appearance and quality. As regards its durability, it compares but poorly with the timber of Deodar. The timber was experimented with in the shape of sleepers by the North-Western Railway, and out of 829 sleepers laid down 32 had to be replaced within 466 days, the average life of the sleepers being put at 2½ years. It is very probable that sleepers of this timber treated with a good antiseptic solution would last very much longer. Under cover the timber is moderately durable. Its weight is approximately 30 lbs. per cubic foot.

Uses.—The timber is most suitable for packing-cases, tea-boxes, fruit-crates and as planks for house-building. It might well be tried for sleepers if first treated with an antiseptic solution. It yields a most excellent wood-pulp (Sindall) and makes up well into match-boxes and sticks (Roller).

Outturn and prices.—The figures of total possible outturn of spruce timber are not available, but so as to illustrate the yield in some districts the following figures are given :—

Locality.	Outturn.	Size of logs or trees.	Approximate value.
PUNJAB. Kangra Division .	The Working Plan contemplates 1,831 trees of both spruce and silver fir being cut annually.	Minimum felling girth of trees at breast-height 7 feet 6 inches.	About Rs 10 to Rs. 15 per ton.
UNITED PROVINCES. Jaunsar Division .	The Working Plan puts the outturn at 800 trees of spruce and silver fir per annum.	Minimum felling girth of trees at breast-height 6 feet.	Value of timber within 12 miles of Chakarata, standing in the forest, 1 anna to 2 annas per cubic foot.

As an illustration of the amount of spruce timber at present coming down the Jumna and Tons, and caught at the junction of the two rivers by the Dakpathar boom, the following figures are given. It must, however, be remembered that the figures by no means represent the total amount of spruce timber available annually but only the existing outturn. Were a demand to arise the amount exported would at once increase. Figures for the year ending March 1910 are:—

	No.	Cubic feet.
B. G. sleepers, 10 feet long	6,340	22,190
" " 8 " "	339	847
M. G. sleepers	1,658	2,487
TOTAL .	8,337	25,524

The Conservator of the Punjab estimates that he could supply 52,500 B. G sleepers annually from the Kulu, Hazara, Bushahr and Chamba Divisions at Re. 1-12 to Rs. 2 per sleeper. In carrying out the experiment above referred to, as to durability of the timber for railway sleepers, it was found that it cost, exclusive of royalty charges, about Re. 1 to land a B. G. sleeper from the Jaunsar forest at Saharanpur.

Enquiries.—Enquiries for this timber should be made of the Conservator of Forests, Punjab, Lahore; of the Conservators of Forests, Eastern and Western Circles, Naini Tal, United Provinces, respectively; and of the Conservator of Forests, Kashmir.

Minor products.—None of importance.

60 *Pinus excelsa*, Wall (The Blue Pine.)

Distribution.—A large evergreen tree found in the Himalayas from Bhutan to Afghanistan, at elevations of 6,000 to 12,500 feet, though not indigenous in Central and North-West Kumaon or Sikkim.

It does not grow to the size of Deodar, Spruce or Silver Fir, but is nevertheless a fine straight tree, up to 130 feet in height and 10 feet girth and over.

Quality of the wood.—The timber of the Blue Pine is superior to that of either the Long-needled Pine, Spruce or Silver Fir, and comes next in quality to Deodar timber. The heart-wood is light-red in colour, very resinous, not brittle, and easy to work, durable under cover and fairly so in the open. As regards the durability of Blue Pine, 927 sleepers were laid down in March 1907, as an experiment, on the North-Western Railway and by August 1908 none had to be replaced, though the Executive Engineer reported signs of dry-rot. At the same time as those sleepers were laid down, sleepers of the Long-needled Pine (Chir), Silver Fir, and Spruce were also given a trial, some of each of which had at the time of inspection already been taken up as useless. The weight of the wood is 30 lbs. to the cubic foot, while the co-efficient of transverse strength, according to tests recently carried out at Sibpur, gave 3·08 tons to the square inch. The timber floats well and does not get water-logged.

Uses.—As mentioned above the timber is hardly durable enough for sleepers unless first treated with an antiseptic solution. It is extensively used for planking and in house-construction, having the advantage over Deodar timber in that it is not highly scented nor apt to exude oil, which collects dirt. It is also used for shingles, tea-boxes, packing-cases, boat-building, troughs and water channels. It has been passed as suitable for match-boxes and sticks, the latter being very strong (Roller). A Calcutta firm of pencil-makers have passed it as fairly suitable for pencils, but inferior to *Podocarpus neriifolia*, for that purpose.

Outturn and prices.—As an indication of possible outturn of Blue Pine timber in various localities, the following examples may be mentioned :—

Locality.	Outturn.	Size of trees.	Value.
PUNJAB.			
Bushahr Division	The average sales for the last eleven years, ending 1892, were 13,794 cubic feet.	. .	The average price realized during that period was 4·28 annas per cubic foot.
Dunga-Galli and Tandiana.	The Working Plan fixes 778 trees to be cut per annum. The average annual amount sold in the depôt at Jhelum between 1898 and 1903 was 4,104 cubic feet	The minimum size of trees to be felled is fixed at 8 feet girth.	The estimated value of each tree standing in the forest is Rs. 15. The average price in the depôt was 7·43 annas per cubic foot.
UNITED PROVINCES.			
Jaunsar Division, Deoban Working Circle.	The Working Plan contemplates 40 stems to be felled annually.	Minimum size of trees to be cut 21″ diameter.	Value estimated at Rs, 6 to Rs. 8 per tree, standing in the forest.
Tehri-Garhwal Leased forests.	Not known . .	. .	Value of trees standing in the forest Rs. 6 each.

As an illustration of the amount of Blue Pine timber cut from the forests along the Tons and Jumna and floated down those rivers to their junction near Dakpathar, the following figures may be cited for the year ending March 1910 :—

	No.	Cubic feet.
B. G. sleepers	19,808	69,328
M. G. „	10,947	16,420
Sleepers 8 feet long	782	1,955
TOTAL .	31,537	87,703

Of this amount by far the greater portion finds its way down to the rail at Jagadhari. North-Western Railway.

Mr. Milward, the Divisional Forest Officer, Jaunsar, states that there is plenty of this timber to be had at Jagadhari railway station on the North-Western Railway at 11 annas per cubic foot. The rate of railing to Howrah works out to 7 to 8 annas per cubic foot, so that the timber landed in Calcutta would be from Re. 1-2 to Re. 1-3 per cubic foot.

The Conservator, Punjab, estimates that the Kulu, Hazara, Bushahr and Chamba Divisions could supply annually 52,500 B. G . sleepers at a cost of Rs. 2-8 each.

Enquiries.—Enquiries for this timber should be made of the Conservator of Forests, Punjab, Lahore ; of the Conservators of Forests, Eastern and Western Circles, United Provinces, Naini Tal ; and of the Conservator of Forests, Jammu and Kashmir State.

Minor products.—For information as to the value and quality of the resin of the Blue Pine, see page 139.

61. *Pinus longifolia*, Roxb. (The Long-needled Pine, or Chir.)

Distribution.—A large, more or less deciduous tree, much resembling the Scotch pine in appearance and forming forests little mixed with other species, except in Sikkim. It is found in the outer Himalayas and in the Siwaliks at elevations of 1,500 to 7,500 feet, often found stretching into the Himalayas up the larger valleys. Large areas covered with this species are found in the Kangra Division of the Punjab, up the valley of the Tons in the Jaunsar Division, as also in the Garhwal and Kumaun Divisions of the United Provinces, and in Sikkim.

Quality of the wood.—The wood is rose to light-red in colour, with long red streaks seen on the vertical section, representing the large resin ducts. It is hard and strong, though less durable than the wood of the Blue Pine. Like that timber it would require treating antiseptically before it could be used for sleepers. It has, however, the advantage over the Blue Pine in that the forests are more accessible and easily worked, besides extending over larger areas. In weight it is heavier than the wood of Blue Pine, being about 40 lbs. to the cubic foot. Gamble states that the timber grown in Sikkim is heavier by 2 or 3 lbs. and is also harder, stronger and more durable than the North-West timber. The co-efficient of transverse strength, according to tests quoted by Gamble and made by Captain Jones, gave 5·09 tons per square inch, while figures of other tests, carried out by Colonel Maclagan, R.E., gave an average of 7·43 tons per square inch. It floats fairly well.

Uses.—The timber is in considerable demand for house-building, tea-boxes, shingles, boat-building, rough furniture and carpentry. It is good for match splints, and for both the inner and outer covers of match-boxes (Evance). It was tried by the Bande Mataram Pencil Factory for pencils, but was pronounced to be too hard for that purpose. Troup gives it as being useful for gymnastic and sporting requisites.

Outturn and prices.—The possible outturn of this timber is very considerable, the fixed annual yield for certain localities is given below, as an illustration of the amount available from State Forests :—

Locality.	Sold in past years.	Future outturn.	Size of trees to be felled.	Value of the timber
1	2	3	4	5
PUNJAB. Kangra Division	The average annual sales during the four years ending 1902-03, of Long-needled and Blue Pines combined were :— Scantlings = 10,801 c.ft. 4,161 c ft. Mining props = 4,468 c.ft. TOTAL 19,430 c.ft.	The number of trees to be exploited is not fixed, but an area of 6,388 acres is to be worked over annually in which mature trees will be felled.	No trees to be felled under 6 feet 6 inches, girth.	The average prices realized for timber sold as stated in column 2 were as follows — Scantlings 5·57 annas per c. ft., rafters 7·74 annas per c ft., and mining props 5·48 annas per c.ft. ; broken pieces 3·3 annas per c.ft.
UNITED PROVINCES. Jaunsar-Bawar	..	The Working-Plan provides 1,968 trees to be felled annually.	Minimum size under which trees are not to be felled 18″ diameter.	The trees are estimated to fetch about Rs. 6 each, standing in the forest.
Tehri-Garhwal Leased forests.	..	..	..	Trees fetch about Rs. 6 per tree standing in the forest.

The amount of timber available annually from the Tons and Jumna forests, (*i.e.*) the amount passing the Dakpathar boom situated just below the junction of the two rivers, and which nearly all finds its way to Jagadhari station, North-Western Railway, for the year ending March 1910 was as follows :—

Size of pieces.	Length.	Number of pieces.	Cubic feet.
Beams	12 ft.	21,950	87,800
B. G. sleepers	11 „	211,714	740,999
Ditto.	8 „	30,762	76,905
M. G. sleepers	..	50,278	75,417
Karis or scantlings	..	247,779	371,668
Pieces	..	6,237	6,237
	TOTAL .	568,720	1,359,026

The Conservator of Forests, Punjab, estimates that the Kulu, Hazara, Bushahr and Chamba Divisions could produce 23,000 B. G sleepers annually at Rs. 2-2 per sleeper.

A thousand trees are sold annually from the forests in the neighbourhood of Naini Tal, and fetch standing about Rs. 10 per tree.

The price of Chir timber at Jagadhari station on the North-Western Railway is from 10 to 12 annas per cubic foot, the cost of railing it to Howrah, 7 to 8 annas per cubic foot.

Enquiries.—Enquiries for this timber should be made of the Conservators of Forests, Eastern and Western Circles, United Provinces, Naini Tal, respectively ; of the Conservator of Forests, Punjab, Lahore ; and of the Conservator of Forests, Bengal, Darjeeling.

Minor products.—The resin obtained from this tree is most valuable. For further notes on the subject, see page 139.

62. *Podocarpus neriifolia*, Don.

Distribution.—A large evergreen tree, with a short to moderately long stem, which, according to Brandis, is often not regularly shaped, though from the Andamans large and fine stems are said to be procurable. It is found growing in the evergreen forests of the Eastern Himalayas, in Sikkim, Assam and Eastern Bengal, Chittagong, in the Tenasserim and Martaban forests of Burma, and in the Andamans.

Quality of the wood.—The wood is, according to Gamble, light-yellow or yellowish-grey, homogeneous, even-grained, soft to moderately hard. It seasons well, without splitting or warping and, as might be expected from so even-grained and soft a wood, works easily and well. Weight 39 lbs. Co-efficient of transverse strength, according to Bennett, 4·72 tons per square inch.

Uses.—The wood is admirably suitable for general carpentry, for which purpose it is extensively used. It is also used for building purposes, in boat-building as masts, spars and oars, and for tea-boxes. Mr. Ghosh of Calcutta states that it is fairly suitable for the manufacture of pencils, but being somewhat tough for this purpose, would be improved by boiling in order to soften it. It has been provisionally passed as suitable by a native firm in Sialkot for the manufacture of set squares and similar mathematical instruments.

Outturn.—The possible outturn is not known; it is, however, fairly large from all sources, the Andaman forests containing many trees of this species. The price in that locality is about Rs. 24 per ton.

Enquiries.—Enquiries for this timber should be made of the Chief Conservator of Forests, Burma, Maymyo; the Conservators of Forests, Eastern and Western Circles, Eastern Bengal and Assam, Shillong; and the Deputy Conservator of Forests, Port Blair, Andamans.

Minor products.—None of importance.

63. *Populus euphratica*, Olivier. (The Bahan tree of Sind and the Punjab.)

Distribution.—A large deciduous tree found in Sind and the Punjab, and stretching into Baluchistan, Afghanistan and westwards to the Mediterranean. It attains a large size in Sind, reaching from 6 to 8 feet in girth and 50 feet in height.

Quality of the wood.—Heart-wood red, compact, fairly hard even-grained, not much over 32 lbs. per cubic foot in weight, fairly strong and moderately durable.

Uses.—The value of this timber is enhanced by the fact that in many of the localities in which it is found other timber is not available. It is extensively used in Sind and Kashmir for boarding and as posts, for common furniture, lacquered boxes, and turnery. Roller of Berlin says it is excellent for match-sticks, as well as boxes. It has been proposed for fruit-crates for the export of fruit from Baluchistan.

Outturn and prices.—The outturn from Sind and parts of the Punjab is fairly large. Gamble gives the price of 100 house-posts as Rs. 30 to Rs. 40. The Conservator of Sind states the price of wood landed at Sukkur station to be 9 annas per cubic foot.

Enquiries.—In Sind the timber is exploited by the annual coupe contractors. For the names and addresses of such persons enquiries should be made of the Conservator of Forests, Sind, Hyderabad ; and for those in the Punjab, of the Conservator of Forests, Lahore.

64. *Pterocarpus dalbergioides*, Roxb. (The Andaman Padauk or Red-wood.)

Distribution—A very large semi-deciduous tree of the Andaman Islands, growing to a height of 80 to 125 feet with a clear bole of 20 to 50 feet and a girth 10 feet and over (B. B. Osmaston) The trunk is frequently much buttressed, especially when growing in damp localities or on low-lying ground.

Quality of the wood—Mr B B Osmaston, Conservator of Forests, who has had a large experience of this timber, describes it as follows :—

> "Andaman Padauk yields a valuable ornamental wood, the colour of which varies in shade from a deep crimson, through cherry-red, dull-red, pink and reddish-brown to brown. The logs yielding the very best crimson-red wood constitute only about 5% of the yield, but about 70% of the logs extracted yield red wood of various shades fit for the foreign market. The remaining 30% consist of reddish-brown or brown timber, the 'off-coloured Padauk,' which is equal to the former in strength and durability, and indeed in every respect, excepting colour."

The question of good, middling and inferior coloured wood must naturally be a matter of opinion, and no definite rules as to the classification can be laid down in this connection. Thus, in 1896-97 and 1898-99, countings were made to ascertain the proportion of "good-coloured" as compared with "off-coloured" logs ; the results obtained gave 808 good-coloured logs out of 1,460 counted or 55 34%

Mr. Osmaston goes on to say that "seasoned wood weighs 48 lbs. per cubic foot. It is very durable, exceedingly strong (Everett's tests for the co-efficient of transverse strength gave an average of 5·01 tons per square inch), and seasons easily and well, either immersed in sea-water or in the dry. Sawn timber is practically immune to the attacks of insects, including white-ants, but is subject to those of marine borers, It works well, does not warp or crack, and takes a fine polish.'

Mr. Osmaston in writing on the subject, states that the timber works well, nevertheless it should be mentioned that it takes a great deal of working to bring it to a fine finish and polish. When the work is well done, the result is all that could be desired for high-class furniture and fittings.

Uses.—This beautiful timber has been used for a variety of purposes. It was formerly extensively used by the Ordnance Department, especially in Madras, but they now seem to prefer the Burma Padauk. It is admirably suited for construction work, such as posts, beams and planks for floors and doors. Its high price, however, restricts its use to ornamental work, such as fittings for railway-carriages, panelling, good furniture, billiard-tables, pianoforte-cases, wainscotting, and similar purposes. It has been exported to America in considerable quantities for fittings of Pullman-cars, and recently fine dining-cars were fitted with this timber at the East India Railway Carriage Works, presenting a most handsome appearance. Troup says it has been used for boat-building, jetty-poles, and casks, but for the latter purpose it was not altogether suitable.

The Chief Engineer, Madras and Southern Marhatta Railway, says that sleepers obtained of this timber appear to be very good, though he doubts the possibility of obtaining a large supply. In his last assumption he is probably wrong, as the "off-coloured" logs would answer the purpose perfectly well, and, as stated above, the quantity of this class of timber is considerable.

Outturn. -The possible annual outturn of this timber is from 4,000 to 6,000 tons from the South and Middle Andamans, while that from the Northern Island may be put at 10,000 tons—an area which is at present not worked.

The export of Padauk in 1906-07, 1907-08 and 1908-09 from the Andamans was 193,233, 33,310 and 33,036 cubic feet, respectively. The value of this timber is from Rs. 60 to Rs. 90 per ton at Port Blair, while very fine coloured logs fetch even higher prices.

Enquiries.—All enquiries for this timber should be made of the Deputy Conservator of Forests, Port Blair, Andaman Islands.

Minor products.—None of importance.

65. *Pterocarpus macrocarpus*, Kurz. (The Burma Padauk.)

Distribution.—A large deciduous tree of Burma, extending, according to Troup, from Bhamo in the north to Tenasserim in the south, to the Chin Hills on the west, and eastwards to the borders of the Southern Shan

States, and possibly crossing into those States. It is found plentifully in the Mu, Ruby Mines and Mandalay Divisions, and also over a large tract in the Pegu Yoma. Elsewhere it is scattered over the area in greater or less quantities, while in certain districts it is altogether absent. It grows to large dimensions, attaining 10 feet girth, but is more commonly found from 4½ to 6 feet girth, 50 to 70 feet in height, and 20 to 40 feet clear bole. (Troup).

Quality of the wood.—Heart-wood, according to Troup, "bright, yellowish-red to dark brick-red, sometimes streaked with brown; hard, close-grained, with fairly large pores, occasionally cross-grained, requiring a sharp plane to plane it smooth, has a very agreeable odour. It seasons well without warping, but is somewhat apt to develop cracks in seasoning if felled green. It is extremely durable, it lasts well under-ground and in contact with water. Weight 55 lbs. per cubic foot, co-efficient of transverse strength 6 58 tons per square inch."

Uses.—This timber has for many years been used by the Ordnance Department in Madras, Jubbulpore and Poona, and is preferred to Andaman Padauk for that purpose. It is used for cart-wheels in Burma, strong furniture (particularly camp furniture), carriage-wheels, frames and shafts, billiard-tables (but is not so ornamental for this purpose as Andaman Padauk), tool-handles, oil-presses, wood-paving, boxes, general carpentry, ploughs, harrows and Burmese harps. (Troup).

Outturn and prices.—Troup in his Forest Pamphlet No. 14 gives the following figures as the possible outturn :—

Myittha Division	100 tons per annum.
Mu ,,	200 ,, ,, ,,
Ruby Mines ,,	800 trees ,, ,,
Mandalay ,,	100 tons ,, ,,
Minbu ,,	40-50 ,, ,, ,,
Pyinmana ,,	250 ,, ,, ,,
Prome ,,	300 ,, ,, ,,
Toungoo ,,	400 ,, ,, ,,
Ataran ,,	200 logs ,, ,,
S. Tenasserim ,,	10 tons ,, ,,

The timber in Rangoon, after the Ordnance Department have made their selection at Rs. 100 per ton, sells for anything from Rs. 20 to Rs. 100 per ton. In Mandalay the 2nd class logs in recent years have sold for Rs. 18 to Rs. 58 per ton, and short pieces, fit for making wheel-hubs, Rs. 80 to Rs. 85 per ton. In the Mu Division it sells for Rs. 100 per ton.

Enquiries—Enquiries for the timber should be made of the Chief Conservator of Forests, Burma, Maymyo.

Minor products.—None of any importance.

66. *Pterocarpus Marsupium*, Roxb. (Honne Bijasal or the Gum-kino tree.)

Distribution.—A large deciduous handsome tree, found in Central and Southern India and also to a small extent as far north as Kumaon and the Behar Hills.

It is found at its best in Southern India, in the South Kanara, Malabar, Coimbatore, Nilgiris, Salem, Tinnevelly, Kistna and Godaveri districts of Madras, in the North Kanara and Belgaum districts of Bombay and in Mysore. In the above localities the tree grows to 6 and 7 feet in girth, 80 feet high, with a clear bole of 25 to 35 feet. One, 10 feet 8 inches girth, measured in North Kanara, may be considered as a large tree

In the Deccan, the Konkan and the Central Provinces districts it is found as a 3 to 5 feet girth tree As evidence that very large trees are not available in large quantities from these localities it may be stated that the Conservator of Forests, Northern Circle, Central Provinces, would not guarantee an annual supply of more than 500 cubic feet of this timber to the Ordnance Department, in logs of 16″ quarter-girth at the centre In the Buldana Division it is only found in small quantities in the Ambularna forest, as a tree 3 feet girth and 16 to 20 feet clear bole In Betul Division it is more abundant and found as a 4½ feet girth tree

In Guzarat it grows to 3 to 4 feet in girth and 60 feet in height, the largest tree recorded by the writer in the Panch Mahals being 5 feet 11 inches girth and 70 feet high, which may be considered a somewhat exceptional tree for that locality.

Quality of the wood.—The heart-wood is yellow to grey-brown, with darker streaks running the length of the tree. It is very hard and close-grained, it works easily and to a good surface, is durable, has a good fracture, seasons well and is not affected by damp and changes of temperature. The Superintendent of the Gun-Carriage Factory, Jubbulpore, states that it is nearly as good as Burma Padauk Its weight is 53 to 55 lbs. per cubic foot, while the co-efficient of transverse strength of tests recently carried out at Sibpur gave an average of 3·75 tons per square inch.

Uses.—The timber is used for building purposes, for door and window-frames, posts and planking, agricultural implements, such as ploughs, harrows, and tool-handles, in making both the body and wheels of native carts. It is extensively used in furniture-making, but has one drawback in that to stop the yellow dye staining it has to be heavily varnished. The Ordnance Department in Madras use it for gun-carriage wheels, wheel-barrows and similar purposes. In the United Provinces it is used for making drums, being preferred for this purpose to other timbers. It has been used for sleepers in Mysore and also on the Neemuch-Holkar line.

Outturn and prices —The amount of timber available from one locality is generally not large, though the total outturn for all India is very considerable From the United Provinces divisions no great quantity can be expected, a few hundred cubic feet might be procured annually from Pilibhit, Gonda, Gorakhpur and Bundelkhand at about 8 annas per cubic foot.

In Bengal the tree is fairly abundant in the Angul and Sambalpur Divisions, but not quite so plentiful in Chaibassa and the Sonthal Parganas; in these localities to grows to a large tree 7 feet in girth and 30 feet clear bole

From the Angul Division the average annual outturn is about 1,248 cubic feet and prices Re 1-4 to Re 1-8 per cubic foot, at Cuttack, for sawn timber, and 14 annas to Re. 1 per cubic foot for timber in the round. In the Sambalpur Division the royalty is 6 annas per cubic foot for green timber and Re 1 and more per cubic foot for sound logs in the market. The cost of landing the timber in Calcutta, all told, comes to Rs. 2 per cubic foot. In Chaibassa it costs Re 1-4 per cubic foot and 8 annas more to land the timber at Lota-Pehar station, on the Bengal-Nagpur Railway.

In the Central Provinces average-sized trees are fairly common, logs up to 4 and 5 feet girth and 15 to 20 feet long being procurable from the Raipur and Chanda Divisions In the Berars it is not very common, 700 cubic feet being the estimated annual outturn from Betul. The royalty price in the forest is 2 annas per cubic foot and the price on Itarsi Railway station 6 to 8 annas per cubic foot.

In the Bombay Presidency the tree grows to 8 feet and over in girth in North Kanara, and the number of trees prescribed to be felled annually in the Working-Plan areas is 282, which would produce about 10,000 cubic feet annually. Mr. Bell, the Conservator, estimates the possible outturn as follows, North Division, Kanara, 100 tons; South Division, 20 tons; East Division, 100 tons, and West Division, 30 tons per annum. The royalty prices in the forest are Rs 24 per ton and the selling prices in the market for fine logs Rs. 60 per ton; an all-round price of from Rs. 35 to Rs. 40 may be taken as the average. To export it from the forest to the nearest railway station costs 6 annas to 10 annas per cubic foot and to

Honawar, Tudri or Karwar ports, 3 to 4 annas per cubic foot, the freight by sea to Bombay or Calicut being about 4 annas per cubic foot.

In Thana, Surat, Panch Mahals and the Deccan the tree grows to a girth of 3 to 5 feet. The prices in Thana at depôt are Rs. 3 to Rs. 4 per kandi of 784 lbs. In the Panch Mahals the timber fetches Rs. 4 for a pole 36 inches girth and 18 feet long and Rs. 5 for selected poles.

In Madras it is found as a large tree in South Kanara and Malabar, the prices and outturn being about equal to those of North Kanara in Bombay. Mr. Brown, of the Malabar Saw Mills, puts the outturn at Calicut at 6,750 cubic feet. In the Nellore, Ganjam, North Arcot and Kistna districts it is scarce and found only as a tree 3 to 4 feet girth and 20 feet clear bole. The price varies from 12 annas to Re. 1-8 per cubic foot on a railway station.

In the Lower Godaveri district it is fairly common, growing 5 to 7 feet girth and 20 feet clear bole. It can be delivered at Samalcot, Rajahmandry and Cocanada railway stations at from Re. 1-4 to Re. 1-10 per cubic foot, the latter place being a seaport.

Enquiries.—Enquiries for this timber should be sent to the Chief Conservator of Forests, Central Provinces, Nagpur; to the Conservator of Forests, Bengal, Darjeeling; to the Conservators of Forests, Northern Circle, Bandra, Southern Circle, Belgaum, and Central Circle, Poona, Bombay Presidency; and to the Conservators of Forests, Northern Circle, Waltair, Central Circle, Madras, and Southern Circle, Coimbatore, Madras Presidency; and to the Conservators of Forests, Eastern and Western Circles, United Provinces, Naini Tal.

Minor products.—The gum known as gum-kino obtained from this tree is valuable, for further reference to which see page 137.

67. *Pterocarpus santalinus*, Linn. f. (The Red Sanders.)

Distribution.—A small to moderate-sized handsome tree, with a straight stem and umbrella-shaped crown. Its distribution is very restricted, it only being found in Southern India, chiefly in the North Arcot, Cuddapah and Nellore districts. It has also been cultivated, a good plantation existing near Kodar in the Cuddapah Division.

Mr. Arbuthnot, Divisional Forest Officer, North Arcot, says that the tree grows to a height of 40 to 60 feet and 4 feet girth, but not often sound above 3 feet in girth, while the amount of sap-wood is very small, not being more than 1 inch in thickness.

Quality of the wood.—The wood is dark claret-red to nearly black in colour, but always with a deep-red tinge, orange-red when fresh cut, shavings giving an orange-red colour (Gamble) The wood is extremely hard, strong and durable. Weight 70 lbs. per cubic foot; the co-efficient of transverse strength 6·35 tons to the square inch (Everett).

Uses.—Formerly the wood was exported to Europe in large quantities for the dye which it yields. Gamble in this connection says that during the five years ending 1882-88, 12,782 tons were exported to the United Kingdom, and 1,116 tons to France. It is now largely used for posts, especially in verandahs of Indian gentlemen's houses, for carving, agricultural implements, such as ploughs and yokes for carts, especially for all parts of wheels, for ornamental purposes, such as carved boxes, idols, picture-frames, brackets, etc. The root-wood is used to a considerable extent for carving and making idols.

Outturn and yield.—The outturn in North Arcot Division is from 40 to 50 tons of timber annually and 20 tons of root-wood. In January 1910 the timber sold for Rs 80 per ton. In previous years the timber did not fetch more than Rs 30 to Rs. 40 per ton and the root-wood Rs. 7 to Rs. 8 per ton In Nellore District most of the mature trees have been removed and only saplings remain.

Enquiries.—Enquiries for this timber should be made of the Conservator of Forests, Central Circle, Madras, and Southern Circle, Coimbatore, Madras Presidency.

Minor products.—For reference to the dye from this wood see page 134.

68. *Quercus dilatata*, Lindl (The Moru Oak.)

Distribution.—A large nearly evergreen tree of the inner Himalayas, extending westwards from Nepal into Afghanistan, usually at 7,000 to 9,000 feet This tree forms a more or less narrow belt of forests above the Ban oak forests and below those of the Kharshu oak. It grows to a fair size, 6 to 8 feet in girth and over 60 to 70 in height, with fairly straight boles in well stocked forests.

Quality of the wood.—The wood is grey-brown to brown in colour, tinged with red, with darker streaks and prominent medullary rays, very hard and fairly durable, of good appearance if cut radially, somewhat difficult to work. It warps and splits in seasoning, but not nearly to the same extent as the Ban or Kharshu oak. Weight 60 lbs. per cubic foot.

Uses.—It is used for building purposes, agricultural implements, such as ploughs and axe-handles. Gamble strongly recommends it for sledgerunners. Troup says it has been tried for beer-casks and found suitable. It yields a fairly good fire-wood, burning slowly, with a blue flame and little smoke.

Outturn and prices.—The possible outturn of Moru and Ban oaks timber is very considerable; as examples of yield the following figures are given for various districts.—

Locality.	Outturn	Size of trees.	Value
PUNJAB.			
Dungri-Galli and Tandiana.	The Working Plan fixes the outturn of Ban and Moru oaks together, at 791 stems to be cut annually		Trees standing in the forest fetch about Rs 12 each.
Kangra Division	The Working Plan contemplates 9,290 trees of Moru and Ban oaks being cut from the Palampur, Kanyara and Narwana-Chanderban Working Circles	Minimum cutting girth 5 feet.	
UNITED PROVINCES.			
Jaunsar Division, Deoban Working Circle.	The Working Plan fixes 132 stems as the possible annual yield	Minimum cutting girth 6 feet	Value of oak within 12 miles of Chakrata, 2 to 3 annas per cubic foot
Naini Tal Cantonment forests	Chiefly *Quercus incana*, 521 trees to be felled annually	Each tree is estimated to contain 36 maunds of 100 lbs	Fire-wood is sold at 4 annas per maund of 100 lbs

Enquiries.—Enquiries for this timber should be made of the Conservator of Forests, Punjab, Lahore; and of the Conservators of Forests, Eastern and Western Circles, United Provinces, Naini Tal

Minor products.—The bark is used to a limited extent for tanning, otherwise the minor products obtained from this tree are unimportant.

69. *Quercus incana*, Roxb. (The Ban Oak.)

Distribution.—A large evergreen tree, found in the Himalayas from Nepal to the Indus, at an elevation of 4,000 to 8,000 feet, and again in the Shan Hills of Burma. It forms a belt of forest below the Moru oak, though on its upper limit both species are mixed together It grows to a fair-sized tree in Jaunsar, with a girth up to 6 feet and height 70 to 80 feet

Quality of the wood.—The wood, like that of Moru, is very hard reddish brown in colour, but is far more liable to split and warp while seasoning than the timber of that species. It has a handsome mottled radial section, which shows the silver grain to advantage. Its weight is from 62 to 64 lbs. per cubic foot and co-efficient of transverse strength 3·94 tons per square inch (Lang).

Uses.—Owing to the difficulty in seasoning this timber it is only occasionally used for building purposes and in preparing agricultural implements. Its chief use is for fire-wood, being one of the most common woods used for that purpose in the Northern and Central Himalayas.

Outturn and prices.—For notes on the outturn of this species see the remarks made against the Moru oak.

Enquiries.—Enquiries regarding this species should be made of the Conservator of Forests, Punjab, Lahore; and of the Conservator of Forests, Eastern and Western Circles, United Provinces, Naini Tal.

Minor products.—None of importance.

70. *Santalum album,* Linn. (The Sandal-wood tree.)

Distribution.—A small evergreen tree of Southern India, found from the Nasik and Nagar districts southwards It is most abundant in Mysore, chiefly in the Shimoga, Kadur, Hassan, Mysore, Tumkar and Bangalore districts, but even there only found in certain parts of the forests. In Madras it is most common in the North Coimbatore district, and fairly so in North Arcot, North Salem, Bellary and the Nilgiris. The only districts in the Bombay Presidency where Sandal occurs are Dharwar, Belgaum, and to a less extent Nasik, Ahmednagar, Sholapur, Bijapur and South Kanara. It is fairly abundant in parts of Coorg. Elsewhere it is cultivated, except possibly in parts of the Travancore and Kolhapur States where it may be found growing wild.

Quality of the wood.—The sap-wood is white, the heart-wood yellow-brown, strongly scented. The wood is hard and extremely close-grained, working to a very smooth surface and easy to cut without causing splits or cracks. Weight 60 lbs per cubic foot.

Uses.—The wood is used for a variety of purposes, the most important of which are of an ornamental nature. It is used in making carved boxes, frames, walking-sticks, handles, pen-holders and other similar articles. It is on this wood that the finest Indian carving is executed. In Mysore, Madras and in North Kanara, at Kumta, the art is extensively cultivated and very beautiful carved sandal-wood work is obtainable. Gamble says that the wood exported to China is used in making coffins for rich people. It is also used by Parsees in their religious fire ceremonies, by Hindus when burning their dead, in performing rites in their temples, and for making caste-marks. The sawdust is used to scent cloths and stuffing pin-cushions, and the bark is chewed by low-caste people as a substitute for betel-leaf. It is from the chips of sandal-wood that large quantities of oil are distilled.

Outturn and prices.—Sandal-wood is probably one of the most valuable trees in the world. In places where it grows, the greatest care is taken in exploiting the trees; and so as to prevent waste they are never felled, but dug out by the roots The axe is never used, as it would cause waste in conversion; in fact the logs and billets are divided as little as possible, and when cut, it is always with the saw. As every part of the tree is of value, most elaborate classifications of the various parts have been adopted, and it is according to these recognised classes that the wood is sold. For instance, in Mysore the wood is divided into eighteen classes, commencing with 1st class "billets" and ending with the last class "sawdust."

The outturn from Government forests according to the latest available Administration Reports was as follows:—

Province	Division.	Outturn	Revenue.
		c ft.	
Madras Presidency .	North Arcot .	2,869	Rs. 87,126.
	South „ .	852	
	North Salem .	1,241	
	South „ .	825	
	North Coimbatore	6,252	
	Nilgiris . .	384	
	TOTAL .	12,424	
		Kandis. mds. lbs.	
Bombay Presidency	South Kanara .	34 0 26	Rs. 24,649-5-4.
	Belgaum . .	50 10 25	
	Dharwar . .	98 4 2 and 127 trees.	
	Bijapur . .	206 trees.	
	TOTAL .	333 trees, 182 kandis, 15 maunds and 25 lbs.	

The outturn from Coorg in 1907-08 was 8,100 cubic feet and the revenue Rs. 1,38,835. The outturn from Mysore in 1906-07 was 2,381 tons, the revenue under this head being Rs. 12,84,983. The average annual outturn of sandal-wood for past years, for the whole of India is summarised below .—

Locality.	Duration from which the average is calculated	Quantity.	Revenue realized.	REMARKS.
			Rs.	
Mysore	10 years ending 1906-07.	3,354 tons gross, 2,129 tons prepared wood	12,49,836*	*Average of 3 years ending 1906-07.
Coorg .	Ditto	184 tons	1,15,759	Ditto ditto.
Madras .	3 years' average ending 1906-07	168 ,,	57,851	
Bombay .	Ditto.	224 ,,	30,001	A large portion of this timber came from Nasik and Nagar districts, the quality being extremely poor.
Travancore .			1,004	
Sasanur .		11 tons	1,117	
Kolhapur .	3 years' average ending 1906-07	15 ,,	1,531	
Sangle	Ditto.	10 ,,	1,400	
Sandur .	One year	4 ,,	2,250	

The average annual quantities of sandal-wood exported from India during 1905-06 and 1906-07 were as follows :—

Locality.	Quantity.	Value.
	tons.	Rs.
Madras Presidency	1517·5	9,69,084
Bombay ,, ...	152·5	83,534
Bengal ,, ...	32·5	70,039

The prices of this timber vary, being from Rs. 8 to Rs. 15 per cubic foot for billets, Rs. 7 to Rs. 11 per cubic foot for root-wood, from Rs. 30 to Rs. 350 per ton for chips, and Rs. 400 to Rs. 500 per ton for sawdust.

Enquiries.—Enquiries for this wood should be made of the Conservators, Central and Southern Circles, Madras Presidency, of the Conservator of Forests, Southern Circle, Belgaum, Bombay, and of the Chief Forest Officers, Mysore and Coorg.

Minor products.—For information on Sandal-wood oil, see page 122.

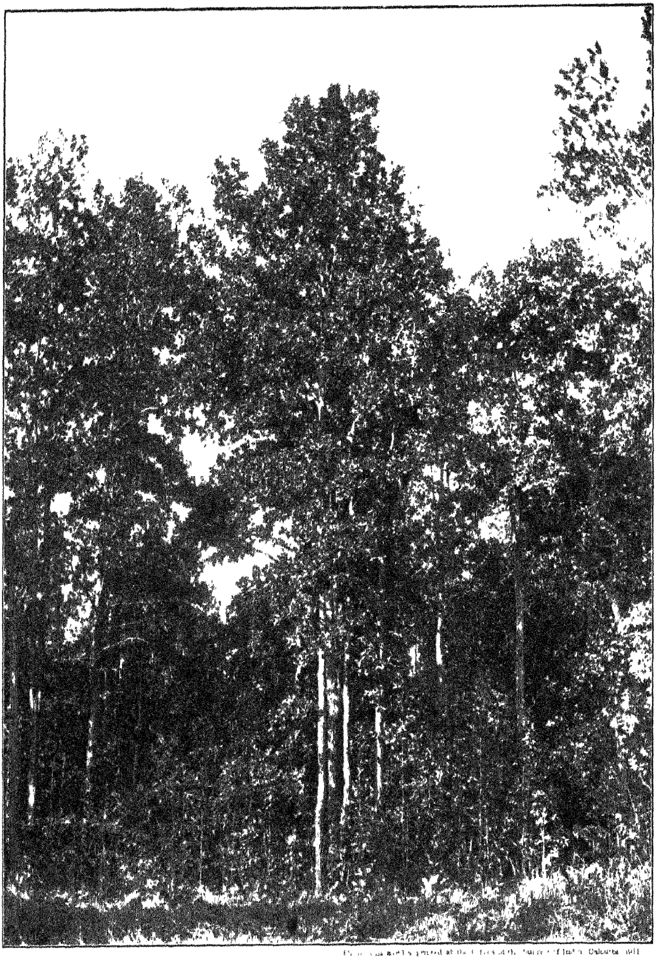
71. *Schleichera trijuga*, Willd. (The Kosum tree)

Distribution—A large spreading tree of great economic importance, owing to the value of its timber and seeds, and to the fact that it is the tree from which the best lac is obtained It has a wide distribution, being found throughout the greater part of India and Burma, except in the dry localities of Sind, Rajputana, the North-West Frontier and Ajmer-Merwara It is also uncommon in Assam and not represented in the Andamans It is most common in the Central Provinces especially in the Raipur district and in parts of the Northern Circle. In Bombay it is common in the Khandesh Satpuras, in Surat, the Panch Mahals, parts of Nasik, Thana and Kanara. In Madras it is common in the Nilgiris, North Coimbatore, Godaveri, Ganjam, Tinnevelly and Malabar It is very common in parts of Burma, especially in the Tenasserim and Pegu Circles. In Bengal it is common especially in Singbhum It is also scattered throughout the United Provinces, but not in the hill forests.

Quality of the wood—The heart-wood is light red-brown, extremely hard and tough, durable, seasons on the whole well, though a little liable to crack, generally only one crack forming According to experiments made in Godaveri district it has considerable power to withstand the attacks of marine borers. It is a fairly heavy timber, weighing up to 68 and 70 lbs per cubic foot, with a co-efficient of transverse strength as high as 764 tons per square inch

Uses.—The timber is probably more extensively used for oil-mills and sugar-cane rollers than that of any other Indian species The timber is highly prized for axles and shafts of carts, as also for naves, felloes, spokes and bolsters of timber carts. Other uses to which it is put are for ploughs, tool-handles, rice-pounds, mortars and turnery It is sometimes used for beams and rafters, but is heavy for this purpose.

Outturn and prices.—Owing to this tree yielding both first quality lac and a valuable seed, the timber supply is limited. Fairly large quantities can, however be relied upon from most divisions in the Central Provinces, Burma, Bombay and Madras. The Conser-



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Shorea robusta (Sal) Forest. Siwalik Division, U. P.

vator of Forests, Southern Circle, Bombay, estimates the possible annual outturn from the four divisions of North Kanara at 250 tons, and this would probably represent a fair average for many of the West Coast divisions. The value of the timber standing in the forest may be put at 2 to 4 annas per cubic foot. On the West Coast, in Kanara, it fetches Rs. 30 to Rs. 40 a ton

Enquiries —Enquiries for this timber should be made of any Conservators of Forests, except those in Assam and Sind.

Minor products.—For a further note on Kosum oil and Kosum lac, see pages 126 and 153.

72 *Shorea robusta*, Gaertn. f. (The Sal tree.)

Distribution —A large straight-stemmed gregarious tree, and after teak, the most valuable timber species found in the Indian forests It occupies two distinct regions , the first forming a more or less continuous belt of forests at the foot of the Himalayas and running up the lower hills to 4,000 feet, the other region occurring in Central India. The northern belt commences in the west with an outlying patch of Sal forest in the Kangra district of the Punjab, the true forest belt first showing in the Ambala Siwaliks and running through the United Provinces, Nepal, the Darjeeling Terai into the Nowgong and Darrang districts in Eastern Assam The Central Provinces group is more scattered, commencing in the east on the Ganges near Rajmahal and runs through the Sonthal Parganas, Singbhum, Palamau, Sambalpur and Puri districts into the Central Provinces, and also found in Orissa, the Northern Circars and ending in the south in Vizagapatam in Madras

The total area covered by Government Sal forests, exclusive of the Madras areas, is computed to be 4,260,535 acres, or 6,657 square miles. (Caccia).

Brandis states that Sal is capable of reaching a great size, thus in the gorges of the Nepal Terai it is found as a tree 100 to 150 feet in height with a clear bole of 60 to 80 feet and a girth of 20 to 25 feet. Gamble states that such dimensions are exceptional, and that as a rule it attains 60 to 80 feet in height, with a 30 to 40 feet clear bole and 6 to 8 feet in girth.

Quality of the wood —One of the strongest and most durable of Indian timbers The sap-wood is of a whitish colour, and not very extensive. The heart-wood is light-brown with a tinge of pink, darkning on exposure, hard, rather coarse-grained, fibrous, not easy to work to a smooth surface and difficult to season, being liable to split and warp.

As regards its durability there is much reliable evidence available proving that it is one of the most durable of timbers. The evidence given by Railway Companies show that its life for sleepers is anything from 16 to 22 years, 18 years being about the average, the Nepal Sal sleepers being preferred. Mr. McIntire, Conservator of Forests, says that old heart-wood is supposed to be superior in durability to that of young trees but that the old heart-wood is liable to split in drying.

In weight it is heavier than teak, being on an average 55 lbs. per cubic foot Its co-efficient of transverse strength varies between 4·51 and 8·98 tons per square inch, a fair average being 6·80 tons per square inch.

Uses.—The primary use of Sal is as timber, and especially sleepers. The Railway Board purchased 405,000 Sal sleepers in 1907-08 and this is by no means the total outturn of Sal sleepers for all India. The timber is also extensively used for house-building, as beams, rafters and planks As regards its use for planks, McIntire says that the timber from the Darjeeling hills and the Terai is rather lighter, splits less, and cuts into better planks than that from Chota Nagpur and Orissa. Its other uses are for agricultural implements, cart-construction, dugouts, helms, oars and masts, and in coopers' work for large vats. Besides being used for sleepers by the Railway Companies, it is also used by them for waggons, buffers, beams and brake-blocks. The Ordnance Department use it for carts, wheel-barrows and similar purposes.

Outturn and prices.—The possible outturn of Sal timber is very large; the following figures may be cited as examples :—

United Provinces—The outturn of Sal in the Western Circle, in 1907-08, was 602,382 cubic feet and in 1908-09, 668,017 cubic feet, while in the Eastern Circle it was 4,788,054 cubic feet during 1907-08 and 4,114,798 cubic feet in 1908-09.

In the Garhwal Division of this Province the timber is extracted in the form of sawn squares and scantlings, rough hewn scantlings and round poles (ballies), and posts. Owing to the configuration of the ground it is difficult to bring out logs of over ½ ton The possible annual outturn from this division may be put at 3 lakhs cubic feet or 6,000 tons, of which 1,000 to 1,500 tons are fit for export. The cost on rail, excluding royalty, is put at Rs. 25 per ton, and the freight to Calcutta Rs. 57 per ton.

From the Kumaun Division there is a similar difficulty in extracting large logs, the outturn taking the shape of scantlings and sleepers. The total amount of Sal wood removed from this division during 1908-09 was 221,611 cubic feet.

The Kheri Division has the largest annual outturn of Sal in the United Provinces ; in 1907-08 it amounted to 2,572,241 cubic feet and in 1908-09 to 2,135,163 cubic feet The cost of extraction varies with the distance from the railway, so that in some instances it may be as much as Rs. 50 per ton, exclusive of royalty, landed on rail.

From the Bahraich Division a fairly large quantity is annually available About 93,000 cubic feet may be expected from the Motipur forests and 16,000 cubic feet from the Sohelwa forests. The cost of extracting 20 cubic feet logs from the Motipur forests to the Murtiha station is Rs 3-14-1 and from Sohelwa forests to Bahraich station Rs. 9-14 ; to these figures must be added about Rs 20 per log for royalty, or Re. 1 per cubic foot The cost of railing the timber to Bombay from Murtiha station comes to Re. 1-4-1 and from Bahraich station Re. 1-3-3 per cubic foot.

The Gorakhpur Division comes next to the Kheri Division as regards outturn of Sal, which stood in 1908-09 at 976,362 cubic feet ; while the Pilibhit and Gonda Divisions had an outturn of 292,364 and 238,311 cubic feet, respectively.

Eastern Bengal and Assam.—The outturn of Sal timber from this Province is also considerable. The number of Sal metre-gauge sleepers supplied by the Forest Department to Railway Companies in 1908-09 was 51,492 : price Rs 2-6-6 each. The Buxar Division turned out in the same year 98,163 cubic feet of sleeper-wood, 2,327 cubic feet of scantlings, and 662 trees were sold standing.

In Goalpara 8,687 acres of Sal forests were worked over, in the process of which mature and unsound Sal trees were removed during 1908-09.

In Kamrup Division 12,169 Sal, not all large trees it is true, were marked for felling, and in Nowgong Division 2,148 Sal trees were cut out in improvement fellings in the same year.

Bengal—The possible outturn of Sal timber from Bengal is also very large ; thus in 1907-08 it was 585,186 cubic feet and in 1908-09 it stood at 746,342 cubic feet, the amount being chiefly procured from the Palamau, Singhbhum, Sonthal Parganas, Sambalpur, Darjeeling, Tista and Kurseong Division.

Central Provinces.—Large logs are procurable from this Province, chiefly from the Mandla and Balaghat Divisions. The possible outturn from Mandla is put at 2,440 large stems per annum and in the Kannat forests of the same Division about 405 smaller tres of 5 feet girth are felled annually. In the Balaghat Division considerable areas of Sal forest occur in the Raigarh and Baihar forests; thus in these forests 1,894 acres were worked over in 1908-09 and fellings take place over approximately similar arears annually.

Madras.—In the Madras Presidency Sal forests occur in the Northern Circle, chiefly in the Ganjam Division. To give an idea of the possible yield it may be stated that in 1908-09, 58,467 cubic feet were extracted from Government forests, of which by far the greater proportion came from the Ganjam district.

As regards the price of Sal timber, it naturally varies considerably. An idea of its value may be obtained from the prices paid by Railway Companies for Sal sleepers. Broad-gauge sleepers fetch anything from Rs. 3-13-0 in the Central Provinces to Rs 4-15-0 for Nepal Sal Metre-gauge sleepers from Eastern Bengal and Assam fetch about Re 1-14-0 each. The royalty on timber charged by Government also varies in different localities according to the class of timber The following are some of the royalty rates, according to Caccia, charged in various localities :—

Locality.	Description of produce	Length	Girth.	Value. Rs.	A.	P.	
PUNJAB.							
Simla Division . .	Ballas	25 feet.	24″	0	8	6	per cubic foot
	Ballis	20 „	12″	0	6	5	
	Tors	12 „	14″	0	5	9	
UNITED PROVINCES.							
	Standing trees.						
Naini Tal Division . .	Under 1½ feet girth.			0	8	0	per tree.
	1½ to 3 „ „			1	0	0	
	3 to 4½ „ „			3	8	0	
	4½ to 6 „ „			8	0	0	
	6 to 7 „ „			15	0	0	

Locality.	Description of produce.	Value.			
		Rs.	A.	P.	
BENGAL.					
	Poles				
Tista Division	Up to 1 foot girth.	0	2	0	each.
	1 to 2 feet ,,	0	6	0	
	2 to 3 ,, ,,	0	12	0	
	Standing trees.				
Singhbhum Division	3 to 3½ feet girth.	0	2	0	per cubic foot.
	3½ to 4 ,, ,,	0	3	0	
	4 to 6 ,, ,,	0	4	0	
	5 to 6 ,, ,,	0	5	0	
	Over 6 ,, ,,	0	6	0	
EASTERN BENGAL AND ASSAM.					
Jalpaiguri Division	Timber.	4 to 7 annas (according to girth) per cubic foot.			

Enquiries.—Enquiries for this timber should be sent to the Conservators of Forests, Eastern and Western Circles, United Provinces, Naini Tal; to the Conservator of Forests, Bengal, Darjeeling; to the Conservators of Forests, Eastern and Western Circles, Eastern Bengal and Assam, Shillong; to the Chief Conservator of Forests, Central Provinces, Nagpur; to the Conservator of Forests, Northern Circle, Madras, Waltair; and to the Conservator of Forests, Punjab, Lahore.

Minor products—For a further note on the bark, oil and resin of this tree, see pages 132, 128 and 136 respectively.

73. *Soymida febrifuga*, Adr. Juss. (The Indian Red-wood, wrongly called East Indian Mahogany.)

Distribution.—A large straight-stemmed, cylindrical, deciduous tree of the dry forests of Central India, Guzarat and Southern India. Common in the Central Provinces, Orissa, the Circars, the Panch Mahals, and extending down the Konkan Ghats into the Carnatic country.

Quality of the wood.—Wood dark red-brown but lacking the ornamental colour of Mahogany. Extremely hard, strong and durable, cross but close-grained, difficult to work. Weight 72 lbs. per cubic foot; co-efficient of transverse strength, according to Skinner, 8·23 tons per square inch

Uses.—The timber is chiefly used for building purposes in the form of beams, scantlings and posts; for agricultural implements, such as ploughs, cattle-troughs, oil-mills by Ganshis in Guzarat; it makes beautiful furniture (Gamble) and is used in turnery and carving. The Journal of the Royal Society of Arts, London, says that it has not yet entered largely into commercial economy at home.

Outturn and prices.—No figures are available as to outturn. Considerable quantities of this timber are available at low rates in the Panch Mahals, Guzarat, and from the Central Provinces, Khandesh and Ganjam

Enquiries.—Enquiries for this timber should be sent to the Chief Conservator of Forests, Central Provinces, Nagpur; to the Conservators of Forests Northern Circle, Bandra, Central Circle, Poona, and Southern Circle, Belgaum, Bombay Presidency; and to the Conservators of Forests, Northern Circle, Waltair, Central Circle, Madras, and Southern Circle, Coimbatore, Madras Presidency.

Minor products—The bark of this tree is used as a febrifuge; otherwise it yields no minor products of importance.

74. *Stephegyne parvifolia*, Korth.

Distribution.—A very large deciduous tree, found in most parts of India, except possibly in Northern and Eastern Bengal and Assam, also found throughout Burma.

The Kallam tree grows to a great size; one recorded from Kanara was 12 feet girth and 60 feet to the first branch, and this may be considered a not unusual size in many parts of India and Burma.

Quality of the wood.—The wood is yellow to pinkish-brown and very similar to that of the *Adina cordifolia* but not so yellow in colour; it is close-grained, easy to cut, and works to a smooth surface. In seasoning it is liable to fine longitudinal cracks, which, however, do not penetrate deep into the log. Weight 45 lbs. to the cubic foot.

Uses.—Its uses are similar to those of *Adina cordifolia.* It is used for building purposes in the form of beams, large logs being exported for this purpose from Surat and Guzarat to Kathiawar and Sind. It is also a favourite timber for dugouts, because of its size and the ease with which the timber lends itself to shaping. It is extensively used in turnery and carving, for such purposes as making bowls, cups, spoons, platters, combs and similar articles

Outturn and prices.—The tree is scattered over most deciduous forests, but not in great quantities. It can nearly always be procured locally in the market for 4 to 6 annas per cubic foot. On the East Coast it sells for Rs. 20 to Rs. 24 per ton. In Guzarat, Thomson puts its price at 4 annas to 5 annas per cubic foot for good logs.

Enquiries.—Enquiries for this timber should be made to any of the Conservators of Forests, except those in Eastern Bengal and Assam.

Minor products.—None of importance.

75. *Taxus baccata*, Linn. (The Yew.)

Distribution.—A large evergreen tree, often not straight-stemmed, faulty, very slow-growing, and living to a great age. Found in the Himalayas at an elevation of 6,000 to 11,000 feet, extending westwards into Afghanistan and eastwards to Bhutan. Again found in Upper Burma in the Ruby Mines Hills. It grows to a very large tree in certain localities. Gamble cites instances of trees 16 and 20 feet in girth and 30 feet cylindrical bole; he states, however, that trees of such sizes are very exceptional but that 8 and 9 feet girth trees are not uncommon in the Punjab.

Quality of the wood.—The wood varies in colour, being lemon-yellow to bright-red and pink and sometimes passing to nearly white; it is close-grained, very elastic and strong, working to an exceptionally smooth surface and taking a fine polish. Weight 44 lbs. per cubic foot

Uses.—The strength and elasticity of the timber make it admirably suitable for bows. Specimens of this wood sent from the Punjab were submitted to the Royal Society of Archers, Edinburgh, who pronounced it most suitable for this purpose.

It is also used for furniture and cabinet-work, shoulder poles, gun-stocks and country carts in Kashmir.

Outturn and prices.—Large and straight logs of this timber cannot be expected, but for the purposes for which it is used such logs are not generally necessary. Large trees occur, but they are often somewhat faulty. The two chief localities from which a fairly large supply may be expected are the Punjab and Kashmir.

The Conservator of Forests, Punjab, estimates that ten to fifteen thousand Yew logs, 4 feet long and 9 to 10 inches diameter, could be landed at Simla station at about Rs. 7 each, exclusive of royalty. The Divisional Forest Officer, Kamraj Division, Kashmir, states that Yew wood is fairly common in his Division, and estimates the cost of landing Yew timber at the Jhelum Railway Station at Rs. 2 per cubic foot, to which would have to be added royalty from 8 annas to 12 annas per cubic foot.

From the United Provinces small supplies might be obtained.

Enquiries.—Enquiries for this timber should be made of the Conservator of Forests, Punjab, and of the Conservator of Forests, Jammu and Kashmir State.

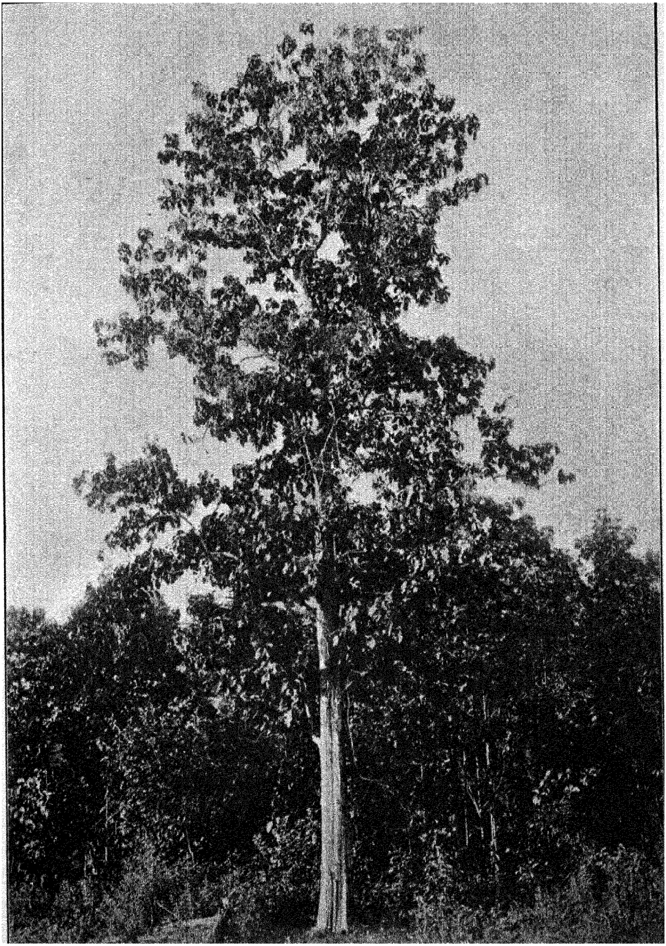
Minor products—The bark of the tree is used locally as a substitute for tea; with this exception the minor products are unimportant.

76. *Tectona grandis*, Linn. f. (The Teak tree.)

Distribution.—Teak occupies two distinct regions in British India, one in the Peninsula of India, and the other in the interior of Burma. In the western area, the northern limit runs a little above the Rewa Kantha Agency; passing through Ratlam State it turns northwards, including outlying patches, as far as Jhansi, receding again on the East Coast. South of this line it occurs in varying quantities, being found as a fine tree in the Chanda district of the Central Provinces, scattered through the Satpuras, Konkan and the Deccan, and probably at its best in these localities just below the Ghats, in the Dangs forests of Surat and in the Peint forests of Nasik. It attains its greatest size in the Western Peninsula, in the Gund and Supa forests of North Kanara, in the Wynaad forests of Malabar, in the Anamalai Hills and in Travancore.

In Burma it grows in greater abundance and to a greater size than in the Western Peninsula. It is found all over the Pegu Yoma, on the eastern slopes of the Arakan Yoma, on the Martaban Hills, northwards, and as a stunted tree up to the 25° latitude at Myitkyina, the present terminus of the railway

Quality of the wood.—The quality of teak is so universally well known to people dealing and working in timber that a lengthy description of this, the best of Indian timbers, is not required. The heart-wood is golden-yellow when first cut, except that of old, twisted slow-grown trees,



Photo, by J. H. [illegible] Photo.-Engraved & prin[illegible] Survey of India, Calcutta, 1911.

Teak at Minge, Toungoo Division, Burma. Girth 11′-7″, height 80 to 90 ft.

[*to face page* 109.

in which it is often dark-brown. On seasoning the wood turns brown to dark brown, and in the case of some Central Provinces and Deccan woods it is streaked with darker bands. With great age the timber turns nearly black. It is moderately hard, containing a large percentage of oil, which greatly helps to preserve it. In strength it does not equal the strongest Indian timbers. Many tests have been carried out with this timber; recent ones by Everett, gave the co-efficient of transverse strength as 4·53 tons per square inch; still more recent tests carried out with the same machine at Sibpur gave 7·66 tons per square inch, when the pressure was applied tangentially, and 6·91 tons per square inch when applied radially, and this with 10% of moisture in the wood. The average weight may be taken as approximately 45 lbs. per cubic foot. Teak timber is exceedingly durable, if well seasoned In buildings it will last for ever, as the saying is; as sleepers it lasts at least 20 years. It seasons well when girdled and left to die standing.

Uses.—It is extensively used for building, in the form of beams rafters, battens, posts and boards, for decks of ships and backing to armour plates of battleships, for boat-building, masts, spars and oars, railway carriages and waggons, cart-building and carriage-making in all their parts; railway sleepers—but for this purpose it is now too valuable; it is used in all departments of carpentry, agricultural implements, coopers' work turnery and many minor purposes.

Outturn and prices.—The outturn of teak timber from Government forests is very large. The following was the outturn of teak from various localities during 1907-08 :—

BURMA.

	Tons.
Pegu Circle	35,931
Tenasserim Circle	42,973
Northern "	77,284
Southern "	69,474
TOTAL .	225,662

MADRAS.

Northern Circle	1,084
Southern "	8,812
Central "	10
TOTAL .	9,906

BOMBAY.

Northern Circle—432 tons by Government agency in the Dangs.
375 tons by purchasers in the Dangs.
1,23,745 trees sold from woodlands in Thana district.
49,475 trees sold on royalty from private lands in the Circle.
20,903 acres of forest containing chiefly teak were sold at Rs. 13-4-1 per acre.
Southern Circle—4,568 tons were taken to depôts and valued at Rs. 4,39,178.
The number of trees to be felled annually of over 6′ girth is 10,516, yielding 8-9,000 tons of timber.
Central Circle—Figures not available.

CENTRAL PROVINCES

Amount of Teak in Government depôts in 1908-09.

	Tons.
Southern Circle	3,711
Berar ,,	10,768

Burma prices.—The sales of teak at the Rangoon depôt during 1907-08 show that the maximum price obtained was Rs. 107-14-3 per ton and the minimum Rs. 60-4-4 per ton, the average being Rs. 80-9-3 per ton. The total quantity exported from Burma during 1908-09 was 94,705 tons, valued at Rs. 95,98,567.

Madras prices.—The prices of teak at Calicut may be gauged from the sales at the Government depôt at Beypore in 1910, which were as follows .—

Best logs of over one ton, Rs. 118 per ton of 50 cubic feet.
,, ,, ,, over ½ ,, ,, 88 ,, ,, ,, ,,
,, ,, ,, under ½ ,, ,, 68-10 ,, ,, ,, ,,
Large saplings Rs. 4-8 each.

Bombay prices.—Gund logs from North Kanara fetch Rs. 125 per ton (selection). The Kanara logs in 1909 fetched throughout just over Rs. 100 per ton.

The Northern and Central Circle teak fetches from Rs. 35 to Rs. 70 per ton and even higher rates in the Thana district.

Central Provinces prices.—57,393 cubic feet were sold in 1907-08 for Rs. 58,346, or slightly over Rs. 50 per ton throughout.

Enquiries.—Enquiries for teak timber should be sent to the Chief Conservators of Forests, Burma, Maymyo, and Central Provinces, Nagpur; to the Conservators of Forests, Central Circle, Poona. Northern Circle, Bandra and Southern Circle, Belgaum, Bombay Presidency; and to the Conservators of Forests, Central Circle, Madras, Northern Circle, Waltair, and Southern Circle, Coimbatore, Madras Presidency.

Minor products.—For reference to the tar-oil obtained from the wood, see page 122.

77. *Terminalia paniculata*, W. and A. (The Kindal or Hongal tree.)

Distribution.—A large deciduous tree of the West Coast, extending from Castle Rock southwards to Travancore, and also found in the South Deccan and Cuddapah district. The tree grows to a great size but is rarely sound over 8 feet in girth; in height it hardly equals the Sain or Asna tree (*Terminalia tomentosa*), the average being 70 to 90 feet with a clear bole of from 35 to 45 feet.

Quality of the wood.—The heart-wood is yellow to grey in colour, very hard, close-grained, cutting to a smooth surface, not so difficult to work and saw as Sain, but somewhat more liable to split. It weighs about 50 lbs per cubic foot. Talbot gives the co-efficient of transverse strength as 5·05 tons per square inch. It is possibly slightly less durable than Sain, though the Madras and Southern Mahratta Railway put its life for sleepers as equal to that timber, *i.e.*, 5 to 10 years.

Uses.—The timber is used extensively for building purposes, as beams, rafters, battens, planking and for frame work; it is used for agricultural implements, such as plough-heads, yokes, handles, etc , as mining props in Dharwar, and the Kolar Gold Fields. The Madras and Southern Marhatta Railway take large quantities annually for building purposes and for such purposes as doors and beds of trucks. It has also been tried for sleepers but has not proved entirely satisfactory for this purpose though it might be if antiseptically treated.

Outturn and prices.—The possible outturn from the West Coast is considerable. In North Kanara and Belgaum districts the number of trees to be felled annually is 7,395, over 6 feet in girth, yielding 5,000 tons of timber. South Kanara could supply 500 tons annually, North and South Malabar 3,000 to 4,000 tons, Tinnevelly 2,000 tons, in all about 10-11,000 tons per year, each log varying from ½ to 1½ tons. The selected timber is sold at present to the railway for Rs. 64 per ton. The royalty price in the forest is Rs. 24 per ton, while the market rates vary from Rs. 30 to Rs. 48 per ton, and for sawn timber from Rs. 1-8 to Rs. 1-10 per cubic foot on the Coast. The cost of freight by sea to Bombay is Rs. 4 to Rs. 6 per ton.

Enquiries.—Enquiries for this timber should be made of the Conservator of Forests, Southern Circle, Bombay, Belgaum; and of the Conservator of Forests, Southern Circle, Madras, Coimbatore.

Minor products.—None of importance.

78. *Terminalia tomentosa,* W. and A. (The Sain, Asna, Ain, Sadra or Mutti tree.)

Distribution.—A large deciduous tree, with a very wide distribution extending from the Ravi river eastwards along the Himalayas, up to 4,000 feet and down through the Peninsula to the south of India. It is also found practically all over Burma.

In the drier areas it is found as a small tree of 3 feet girth and 25 to 30 feet in height, in areas where the rainfall is 80 inches per annum and over, and especially in valleys and depressions, it grows to a great size. Thus on the West Coast, in parts of the United Provinces, Central Provinces and Bengal and in Tinnevelly, as also in Burma, trees of 8 to 10 feet girth and 80 to 100 feet in height are common. In such regions the bole is clean and straight up to 50 feet, and very large logs are obtainable.

Quality of the wood.—The heart-wood is brown to dark-brown in colour and with a purple tinge when freshly cut, turning greyer on exposure, beautifully streaked, and when polished of handsome appearance; very hard, especially when the timber is old; close-grained, difficult to saw and plane, and somewhat difficult to season. As regards its durability, some doubt seems to exist on the subject, though the reports available from railway companies go to prove that it is very fairly durable. Thus experiments made by the Eastern Bengal State Railway show that its life for railway sleepers is between 8 and 10 years, these figures being the result of at least five different experiments. The Madras and Southern Marhatta Railway put its life at 5 to 10 years. Under water, in the sea, logs laid down in the Goa harbour were taken up after 15 years and found to be perfectly sound. It is a strong timber, equal to, if not stronger than, teak; the co-efficient of transverse strength, according to tests carried out recently, gave an average of 5·08 tons to the square inch, while other tests have given 8 tons and over per square inch. In weight it is 67 lbs. per square inch.

Uses.—The timber is universally used throughout India for building purposes, in the construction of native houses, being especially employed for beams, posts, and rafters and to a less extent for planks; it is also used for agricultural implements, such as plough-heads, harrows, yokes, cart-poles, shafts, oil-miles, rice-pounds and axles of carts. The Public Works Department use the wood in Kanara for bridging. It is used for

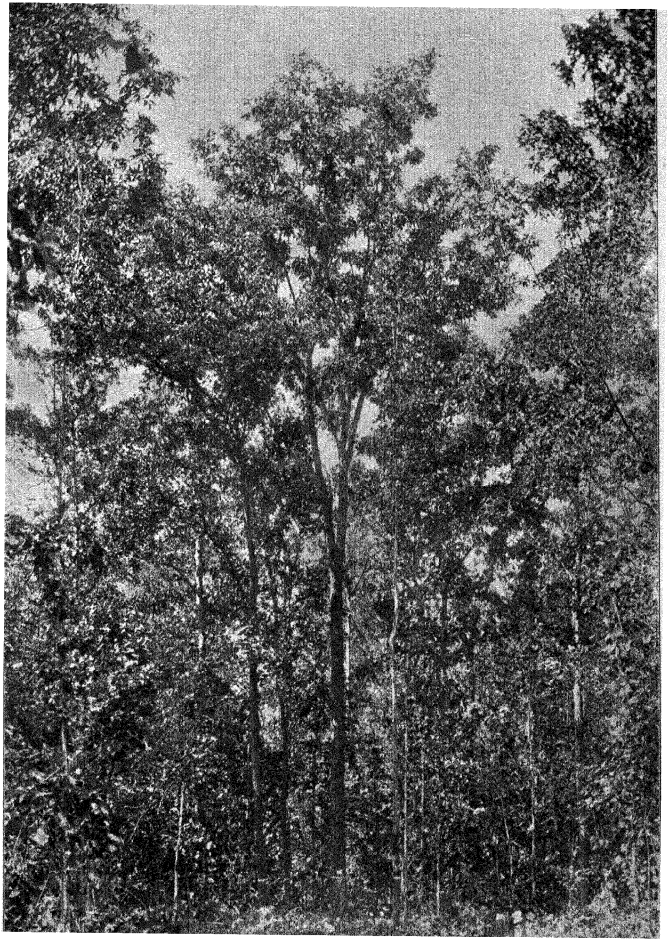


Photo.-Engraved & printed at the Offices of the Survey of India, Calcutta 1911.

Terminalia tomentosa trees, Siwālik Forest Division, U. P.

[to face page 104.

mining-props (in the Kolar Gold Fields), rough carpentry for native cots and benches, solid cart-wheels (Singhbhum), elephant boxes (Mu Division, Burma), and boat-building, but is heavy for this purpose. For sleepers it is not altogether satisfactory in spite of its lasting up to 8 and 10 years; possibly if antiseptically treated it would answer the purpose better.

Outturn and prices.—The possible outturn of the timber is very great, which fact combined with the straight large logs procurable from many localities in India and Burma, and the strength and good appearance of the timber, renders it worthy of the attention of timber merchants. It is only possible to give a few examples of the possible outturn and prices in various localities, as were all the information tabulated it would take up too much space. However, enquiries of the Conservators regarding the supply from special localities can always be made.

The following examples are given as a guide to the possible outturn and ruling prices for this timber from a few localities only, the information having been collected from the Forest Officers concerned :—

Locality.	Amount available annually.	Size of logs or trees	Approximate value.
UNITED PROVINCES.			
Garhwal Division .	The Working-Plan gives 50,458 trees of over 5 feet girth or roughly 1,500 trees to be felled per annum. Minimum cutting size 6 feet girth.	Trees of 8 feet girth and over are common, with 50 feet clear bole	Royalty prices in forest, 3 annas per cubic foot for logs in the round Poles sell for 1 anna to Re. 1-2-0 each, according to size.
Kumaun Division .	Average annual outturn for past five years was 40,900 cubic feet The Working-Plans prescribe 1,125 stems to be cut annually.	6 feet minimum exploitable girth.	Royalty 2 to 3 annas per cubic foot, standing Timber landed at Haldwani station, including royalty, comes to 6 and 7 annas per cubic foot for logs and 9 to 10 annas per cubic foot for sawn timber.
BENGAL.			
Chaibassa Division .	A large supply available, but no definite figures can be given.	Trees of 6 feet girth and 40 feet clear bole available.	8 to 12 annas per cubic foot at Lota Pahar station, Bengal-Nagpur Railway.
Kurseong Division .	Very abundant, exact amount available cannot be given.	Trees of 6 feet girth and 40 to 50 feet clear bole available.	8 annas per cubic foot in forest.
Angul Division . .	Abundant in the plain forests, many large trees available.	Trees 8 feet in girth and 30 feet clear bole available. Minimum exploitable girth 6 feet.	Cuttack market 8 to 10 annas per cubic foot in the round Royalty prices—3 to 5 feet girth 1 anna per cubic foot, 5 to 7 feet girth 2 annas per cubic foot, over 7 feet girth 3 annas per cubic foot.

Locality.	Amount available annually.	Size of logs or trees.	Approximate value.
EASTERN BENGAL AND ASSAM.			
Buxar Division	Not very common	Trees 6 feet girth and 40 feet clear bole available	Royalty—logs of 25″ to 53″ girth 2 annas per cubic foot, 54″ to 71′ girth 3 annas per cubic foot, 72″ and over 4 annas per cubic foot.
CENTRAL PROVINCES.			
Melghat Division	4 per cent to 15 per cent of the growing stock is of this species	Trees up to 10 feet girth and 50 feet clear bole available, average size about 6 feet girth	Standing in the forest. Girth. Length. 10″—14″ 15 feet and over 1 anna each. 14″—18″ „ „ 2½ annas „ 18″—22″ „ „ 4 annas „ 22″—26″ „ „ 7 annas „ 26″—30″ „ „ 11 annas „ 30″—34″ „ „ Re 1 each. 34″—38″ „ „ Re. 1-8 each. over 38″ „ „ Rs 2-3 „ Logs under 8 feet in length, half price Rs 11 per cart of 6 maunds of 80 lbs on rail at Amraoti
Betul Division .	20 per cent of the growing stock in favourable places 20,000 cubic feet yearly is the estimated outturn.	6 feet girth and over with a 30 feet clear bole.	3,447 cubic feet sold for Rs 430, being the average for five years, which works out to 2 annas per cubic foot in the forest The cost on the nearest railway station at Itarsi, Hoshangabad district, works out to Rs 5 per cart of 15 cubic feet, to this must be added 2 annas per cubic foot for royalty.
BURMA.			
Myittha Division, Northern Circle.	1,000 tons available annually	Trees of 6 feet girth and 70 feet clear bole available.	Royalty Re 1 for full-sized log. Posts Rs. 10 per 100. Price on rail Rs. 14 per ton at Alon station and Rs 28 to Rs 30 per ton in Rangoon
Katha Division .	500 ton available annually.	Trees of 7 feet girth and 50 feet clear bole available	Rs 10 per ton on rail at Katha, Rs. 15 per ton at Mandalay.
Bhamo Division .	Several thousand trees available annually.	8 feet girth and 60 to 80 feet clear bole.	Rs. 20 to 25 per ton at Katha railway station and Rs. 40 per ton f o b. Rangoon.
Mu Division .	500 tons available annually	Trees of 10 feet girth and 40 to 50 feet clear bole available.	Duty Re. 1 per tree standing. Price of timber Rs 10 to 15 per ton in the round and Rs 30 to 35 per ton on station at Kodaungto, Kyatthin, and Pintha.
BOMBAY.			
North Kanara Division	The number of trees to be felled annually according to the various Working-Plans amounts to 10,149 stems or about 9—10,000 tons, even more perhaps as the Conservator makes his estimate at 13,000 tons.	Trees of 7 feet girth and 60 feet clear bole available.	Royalty Rs. 24 per ton and in market running up to Rs. 50 per ton and more for logs of great length Price at Karwar port Rs. 50 to Rs. 60 per ton.
PUNJAB.			
Simla Division .	Fairly common .	Trees of 3′ 6″ girth and 15 to 20 feet clear bole available	12 annas per cubic foot at Jagadhari station, North Western Railway.
MADRAS.			
Malabar Division .	1,000 tons available annually.	Trees of 6 to 8 feet girth and 50 feet clear bole available.	Rs 30 to Rs. 40 per ton at Calicut. Sawn timber about Rs. 2 per cubic foot.

The total outturn from the Government forests in Madras for 1908 was 90,204 cubic feet; if further demand were to arise, this amount could be greatly increased.

Enquiries.—Enquiries for this timber should be addressed to any of the Chief Conservators, Conservators, or Divisional Forest Officers in India and Burma.

Minor products.—For a note on the bark of this tree, which is used for tanning, see page 132.

79. *Vateria indica*, Linn. (The Piney Tallow tree)

Distribution.—A large evergreen tree of the Western Ghats from Kanara to Travancore.

Quality of the wood.—Grey to light-grey in colour, moderately hard, working to a fairly smooth surface, and presenting a glossy appearance if well planed. In weight from 36 to 40 lbs per cubic foot, and strength, according to Gamble, 3 33 tons per square inch.

Uses.—The timber is used for dugouts, is said to make up into good cheap flooring and ceilings ; it is also used for packing-cases, coffee-chests, and occasionally in construction.

Outturn and prices.—The outturn in Malabar is put at 500 tons per annum and the price of scantlings at Re. 1-4-0 per cubic foot, and planks at Re. 1-6-0 per cubic foot.

Enquiries.—Enquiries for this timber should be made of the Conservator of Forests, Southern Circle, Madras, Coimbatore, and of the Conservator of Forests, Southern Circle, Bombay, Belgaum.

Minor products.—For reference to Piney resin see page 136 and 138.

80. *Xylia dolabriformis*, Benth. (The Pyinkado or the Iron-wood tree of Burma or Jamba tree of Southern India.)

Distribution.—A large deciduous tree, with a straight, though at times, fluted, stem, found extending from the Chanda Division in the Central Provinces southward down the Western and Eastern Ghats of the Peninsula In the deciduous forests of Burma and Arakan it is very common and grows to a large size ; and also on the Western Ghats, boles of 40 feet long and 8 feet girth and over being not uncommon. It grows in great abundance in suitable localities, often forming nearly pure forests in North and South Kanara.

Quality of the wood.—The heart-wood is dark reddish-brown, annual rings darker, but not distinct, very hard and difficult to saw, especially the seasoned timber, close-grained and somewhat twisted, cutting to a smooth shiny surface. The quality of the Burman and Indian timbers appear to differ considerably, though both are liable to crack while seasoning; the Indian-grown timber is far more liable to this defect than that of Burma. As regards durability there is a great difference; in Burma the timber is readily accepted for sleepers and lasts from 15 to 20 years in that state, while Indian-grown timber lasts not more than 6 to 11 years according to the climate to which it is subject. The reason for this difference in the quality of the timber has not yet been fully explained. In strength the Burma timber has also shown itself to be superior to the Indian-grown variety. Gamble gives various examples of the coefficient of transverse strength of timbers from both localities; he gives Burma timber as varying between 7·68 and 9·57 tons per square inch and Indian timber between 3·23 and 6·72 tons per square inch. Recent experiments, carried out at Sibpur, gave Burma timber 6·07 and Bombay timber 2·81 tons per square inch. The timber is considerably heavier than teak, weighing 60 lbs to the cubic foot.

From experiments carried out in the Lower Godavari district in Madras it was found that the timber was attacked within two years by marine borers

Uses.—The primary use to which the Burman timber is put is for sleepers, and owing to its strength, hardness and durability it is admirably suited for that purpose. The Indian timber has also been used for sleepers but not to the same extent as the timber from Burma. It is extensively used for house-building in the form of posts, beams and scantlings, in bridge-construction, for buffers of railway trucks, in both Peninsulas; in Burma for telegraph posts, boats, dugouts and canoes, and also for ship-building, especially as knees, crooks and keels (Troup). It is used for agricultural implements, such as ploughs, harrows, clod-breakers, oil-presses and yokes, and elsewhere for tent-pegs and railway keys; by the Ordnance Department for cart-poles and axle-cases; and for paving-blocks in Rangoon. In Northern Kanara and Belgaum it is largely exploited as fuel to supply the Madras and South Marhatta Railway, up to 45,000 tons being cut annually.

Outturn and prices.—The possible outturn of this timber from both localities is very large. The Chief Conservator of Forests, Burma, in 1906, computed the possible yield with a view to estimating the possible outturn of sleepers within convenient reach of the railway; the following are the data :—

Pegu Circle.	Prome Division . .	18,000 trees of 7′ 6″ girth and over.
	Tharrawaddy Division .	15,000 „ 7′ 6″ „ „
	Rangoon Division .	33,000 „ 7′ 6″ „ „
	TOTAL .	66,000 trees.
Tenasserim Circle.	Toungoo Division .	166,000 trees of 7′ 6″ girth and over.
	Shwegyin Division .	47,000 „ 7′ 6″ „ „
	TOTAL .	213,000 trees.
Southern Circle.	Pyinmana Division .	80,000 trees of 7′ 6″ girth and over.
	TOTAL .	80,000 trees.
Northern Circle.	Myittha Division .	180,000 trees of 7′ 6″ girth and over. (approximately).
	TOTAL .	180,000
	GRAND TOTAL .	5,390,000 trees over 7′ 6″ girth.

Estimating that these trees are to be cut out in the next 25 years, starting from 1906, the annual yield would be 21,560 trees to be felled annually, or taking a tree as yielding 30 sleepers, there would be 646,800 sleepers available annually. The above figures are for trees to be found within fairly easy reach of a railway and by no means represent the possible outturn for the whole of Burma. The timber is in good demand in Burma so that the price is now somewhat high. Scantlings sell at Rs. 70 to 80 per ton and M. G. sleepers fetch Re. 1-12 each. The freight from Rangoon to Calcutta is Rs. 13 per ton, so that scantlings landed in Calcutta would cost from Rs. 83 to Rs. 90. The Nizam's Railway pay Rs. 2-4-0 for M. G. sleepers from Burma and the South Indian Railway about Rs. 2-12-0 for B. G. sleepers.

In Bombay the chief sources of supply are Belgaum and the four forest Divisions of North Kanara. Belgaum alone is capable of yielding at least 30,000 tons of poles and fuel annually, the price of fuel landed on the station being from Rs. 14 to Rs. 15 per ton stacked (68 cubic feet). The four Kanara Divisions are estimated to have yield of 10,000 tons per annum of logs over 6 feet girth. The selling price on the coast at Karwar is from Rs. 24 to Rs. 32 per ton, freight by sea to Bombay Rs. 5 to Rs. 6 per ton. The price paid for Indian M. G. sleepers by the West India Portuguese Railway is about Re. 1-6-0 to Re. 1 7-0 per sleeper In Madras this species chiefly occurs in South Kanara, Malabar, and on the Eastern Ghats in Vizagapatam district. From Malabar some 50,000 cubic feet is the estimated possible annual yield from Government and private forests, though at present it does not exceed 12,000 cubic feet from Government forests; the whole outturn for the Presidency in 1908-09 was 15,625 cubic feet. In the Central Provinces the timber is found in the Southern Circle but is not largely exported In Bengal, the Puri Division is estimated to yield some 3,000 to 4,000 cubic feet a year, the price of landing at Cuttack being about Rs. 8-8-0 per ton, exclusive of royalty.

Enquiries.—Enquiries for this timber should be addressed to the Chief Conservators of Forests, Burma, Maymyo, and Central Provinces, Nagpur; to the Conservator of Forests, Southern Circle, Bombay Presidency, Belgaum; and to the Conservators of Forests, Northern Circle, Waltair, and Southern Circle, Coimbatore, Madras Presidency.

Minor products.—The bark of this tree yields a tan extract, and the seed and oil, otherwise the minor products are unimportant.

CHAPTER III.

MINOR FOREST PRODUCTS.

Under this heading come all Minor Forest Products. These for convenience may be divided into two sections, (*i*) those exported from the forest and used for manufacturing and other purposes; (*ii*) those utilized in the forest or merely removed by right or privilege-holders to their homes for their own use. Naturally some of the products come under both heads.

Under the former class may be mentioned cutch, myrabolams, fruits, certain gums, mohwa flowers and seeds, colophony and turpentine, the product of pine-resin, babul-bark for tanning, rubber, and lac. As examples of products coming into the second class may be mentioned jungle roots, fibres used in making coarse ropes and twine, edible seeds, flowers and leaves used for dyeing, drugs extracted from various parts of trees and shrubs, of which a few also come under the first class, leaves for plates, grass for thatching, litter, and a variety of similar products, often of considerable local value to the inhabitants living in or near the forest.

The revenue realized by the sale of Minor Forest Produce in 1907-08, including that given free, was Rs. 71,39,241, while from 13 to 14 million cattle were grazed either free or on payment of a small sum per head. The revenue realized by the sale of grass and collected under grazing fees stood for the same year at Rs. 22,13,199.

It will be readily understood that in this publication, the length of which is limited, it is not possible to mention more than a few of the most important Minor Products, chiefly those coming under the first category, giving some idea of their value and where they may be procured. The classification adopted depends on classes of products and not on natural orders.

1. Fibres and Flosses.

Fibres and flosses play an important roll amongst the economic products obtained from the forests, a considerable revenue being derived from some of them, such as from Munj-grass fibre used in basket, chair and rope-making and Bhabar or Sabai-grass sold for paper-making; again, bast-fibres are extensively used by the Department, timber contractors, and private persons in the preparation of elephant drag ropes and for rafting purposes, while a large quantity of bast and leaf-fibre obtained from a variety of forest trees and shrubs supply the daily wants of the forest villagers and agricultural population.

Flosses are obtained from the seed of certain trees and yield a fibre known on the market as "Kapok," the right to collect which is either sold or given free in different localities, while their uses are confined to stuffing pillows, as they are generally of too short a fibre for textile purposes.

(a) *Fibres from Leaves.*

Screw Pine fibre.

The leaves of the Screw Pines, *Pandanus* spp., yield a strong, moderately fine fibre, used for making cordage, fishing-nets, lines, brush-bristles, and sacking. The most important and abundant of the Screw Pines found in forests is probably *Pandanus odoratissimus*, a shrub forming dense thickets in the Sunderbans, so dense indeed that they are a considerable obstacle to travellers or inspecting officers. A proposal has been put forward to use this fibre for paper-making, the forests being situated at no great distance from the Calcutta market. The species is also found growing in the tidal creeks of the Tenasserim, the Coromandal and West Coasts, and is also common in the Andamans.

Enquiries.—Enquiries for the leaves yielding this fibre should be made of the Conservator of Forests, Bengal, Darjeeling; the Conservator of Forests, Tenasserim Circle, Burma, Rangoon; and the Deputy Conservator of Forests, Andamans, Port Blair.

The Sago Palm fibre.

From the leaves of the Sago Palm or Bastard Sago, *Caryota urens*, is obtained the "Kittal fibre" of commerce. This palm is found growing scattered in the moist forests of Assam, Chittagong, East Bengal, Orissa, in the valleys of Thana, Kanara, Malabar and Tinnevelly, in Upper Burma and Pegu, and also in the sub-Himalayan districts east of Nepal. The fibre is of considerable value, being strong and of fair length. It is used by fishermen in preparing their nets and fishing-lines, for bristles of cloth, hair, and horse-brushes, in rope and cord-making, for baskets, sacking, etc. It has also been proposed as a possible paper-fibre. It is not exported to any great extent from India, but in considerable quantity from the Malay Straits. Its price in the English market is from 2*d* to 8*d*. per lb., according to quality.

Enquiries.—Enquiries as to the conditions under which this fibre can be obtained should be made of the Conservator of Forests, Eastern Bengal and Assam, Shillong; the Chief Conservator of Forests, Burma, Maymyo; the Conservator of Forests, Southern Circle, Madras, Coimbatore; and the Conservator of Forests, Southern Circle, Bombay, Belgaum.

Agave or Sisal fibre

There are several species of the well-known Agave plant yielding Sisal fibre; their interest, from a forest point of view, lies in the fact that they are cultivated in many districts either in plantations or along the edge of the Reserved Forests, for demarcation purposes, while the fibre obtained from their leaves also yields a certain revenue. *Agave rigida*, of which there are several varieties, has been cultivated in the Central Provinces, the common Agave being the grey variety, *Agave lurida* and *Agave vivipara*, and also a narrow-leafed variety, *Agave americana*. Throughout the Deccan Agave species have been cultivated in various localities, as for instance in the Nasik, Satara and Poona forests, and also in Madras and Burma, though by far the greater percentage of "Sisal" fibre is obtained from cultivated lands, and not from forests, The price of Agave fibre in the London market varies between £12 and £40 per ton, the lower prices being those for native hand-prepared varieties and the higher price that for best machine-prepared fibres.

Enquiries.—Enquiries for the fibre should be made of the Chief Conservator of Forests, Central Provinces, Nagpur, and the Conservators of Forests in Bombay, Madras, Bengal and Burma.

Plantain fibre.

Certain wild plantains or bananas occur in the forest and yield a strong fibre. They are also widely cultivated throughout British India.

Musa sapientum, the common plantain, is found in the hot, damp forests of India, *Musa superba* on the Western Ghats, and *Musa paradisiaca* is the red plantain of Bombay. These fibres are used in rope and cordage making, for mats, and for preparing an inferior grade of paper. From a forest point of view they are not important, not being sufficiently plentiful and generally too sparsely scattered to make their collection profitable.

Wild Date and Palmyra Palms

The leaves of the Wild Date, *Phœnix sylvestris*, and the Palmyra Palm, *Borassus flabellifer*, have a certain commercial value and are used for thatching purposes, while the leaves are collected for making fans, hats and umbrellas. Thus in 1908-09 the forest revenue under this head was Rs. 17,130 in Madras, Rs. 3,051 were obtained for thatching leaves (probably Palm leaves) in the Andamans, Rs. 1,055 were realized for leaves, chiefly of these Palms, from the Southern Circle and Rs. 1,132 for Palm leaves from the Northern Circle of Bombay.

Enquiries.—Enquiries as to the sales of these leaves should be made of the Conservators of Forests, Central Circle, Madras, Southern Circle, Coimbatore, Northern Circle, Waltair, Madras Presidency; the Deputy Conservator of Forests, Andamans, Port Blair; and the Conservators of Forests, Southern Circle, Belgaum, and Northern Circle, Bandra, Bombay Presidency.

Golpatta.

In the Bengal Presidency, especially in the Sunderbans, in Chittagong, Burma and the Andamans occurs a palm, *Nipa fruticans*, the leaf of which yields a fibre which is made into mats, it being also use for thatching. It is extensively exploited from the Sunderbans; for instance in 1908-09, 151,060 tons were extracted, realizing Rs. 73,763.

Enquiries.—Enquiries for Golpatta should be made of the Conservator of Forests, Bengal, Darjeeling, and the Chief Conservator of Forests, Burma, Maymayo.

(b) *Stem and Bast-Fibres.*

A very large number of both trees and shrubs yield bast-fibres, some coarse, strong and only suitable for making ropes, others fine, soft and silky, more suitable for the preparation of strong thread and twine for fishing-nets, lines, snares and traps.

Though a few of these fibres have a commercial value, the majority are of local value only, and are removed free by right and privilege-holders or are collected by the Department for preparing timber drag-ropes and for rafting purposes. Thus, from a financial point of view, they do not at present play an important part, though from an economic point of view they are often nearly indispensable.

Sterculiaceæ Trees belonging to the Order Sterculiaceæ yield valuable fibres, the most important of which is *Sterculia villosa*, a common tree throughout India and Burma. It yields a coarse, strong whitish-pink fibre, of a peculiar net-like appearance, stripping off the tree in broad long flakes. It is extensively used on the Malabar Coast, in Burma and Bengal for preparing elephant drag-harness, by natives for tying the rafters of their houses, for tying bamboo and firewood-bundles, making bags and cattle halters. The fibre is sufficiently strong and obtainable in sufficient quantities to be worthy of the attention of the trade. Other trees of this order, such as *Sterculia urens*, *Sterculia fœtida*, and *Sterculia colorata* also yield rope fibres but of a quality inferior to *Sterculia villosa*.

Helicteres Isora, also belonging to this Order, is a shrub found in the drier forests of India and Burma and yields a strong light-brown fibre, not so coarse as that of *Sterculia* spp. The bast, however, is more difficult to separate from the bark, and therefore requires longer soaking in water and to be more carefully retted before it can be made into rope and twine. It is used for tying rice bundles in South India, as cordage for sewing gunny-bags and making bullock nose-ropes.

Enquiries.—Enquiries for the fibres of *Sterculia villosa* and *Helicteres Isora* should be made of any of the Conservators of Forests in India or Burma, asking them to give the names of local contractors who have purchased trees among which these species are to be found.

Leguminoseæ The large Order of Leguminoseæ contain many species yielding bast-fibres, the most important of which are the Anjan tree (*Hardwickia binata*) found in the Central Provinces, Berars, Bombay (Central Circle) and in the Kistna, Godavari, Anantapur, Cuddapah, Kurnool and Bellary districts of the Madras Presidency. The fibre obtained from the branches is red-brown in colour, fairly strong and stripping off in narrow bands. It is used for making ropes, but unless well prepared it presents an untidy appearance. The large creepers, *Spatholobus Roxburghii, Bauhinia Vahlii and Calycopteris floribunda*, commonly found in most Indian forests and doing much damage to tree growth, have the redeeming feature of yielding valuable strong rope-fibres used locally by natives for tying faggots and for domestic purposes. The stems of the latter are cut into strips 4 feet long, $\frac{3}{4}$ inch to 1 inch broad and $\frac{1}{16}$ inch thick, and after being soaked in water to make them supple, they are woven into mats and baskets The fibre of the former is "whitish-pink" in colour and used extensively on the Malabar Coast for tying rice-bundles, called "mundis."

The other species of this Order yielding bast-fibres are *Ougeinia dalbergioides, Acacia leucophlœa, Bauhinia racemosa, Bombax malabaricum, Butea frondosa, Millettia auriculata, Dalbergia Sissoo*, etc.

Tiliaceæ.

The most important fibre-yielding species of this Order are the Grewias, of which may be mentioned *Grewia tiliæfolia, G. vestita, G. oppositifolia, G lævigata*, and *G. scabrophylla*. They all produce coarse yellow-brown strong fibres, especially *Grewia tiliæfolia* and *G. oppositifolia*, used in rope-making and for domestic purposes. To this Order also belongs *Corchorus capsularis* and *Corchorus olitorius* yielding the jute of commerce.

Urticaceæ.

This Order contains many fibre-yielding trees, not the least important of which is *Ficus Cunia*, yielding a short though strong fibre of yellow colour, which is made into ropes. *Ficus religiosa* and *Ficus bengalensis* yield somewhat inferior fibres, used by wild tribes and by others only in default of better species.

Bœhmeria nivea the "Ramie" fibre and *Cannabis sativa*, the Hemp fibre, both largely cultivated, yield comparatively fine white fibres, extensively used in rope-making. Of other species may be mentioned *Bœhmeria malabarica, Bœhmeria platyphylla, Bœhmeria macrophyll*, all yielding useful fibres, used for rope-making, and some for fishing-lines and nets.

Trema orientalis, a shrub or small tree found in most forests of India, yields a long light-brown fibre stripping off the stem in narrow thin bands, easily separated after being dried for some time, and used for making ropes and twine on the West Coast, and in the preparation of coarse cloth.

Antiaris toxicaria yields a peculiar coarse fibre of net-like appearance, which strips off the tree in large sheets, so large indeed that by sewing up one end and side a whole bag can be made of one slab of fibre.

Broussonetia papyrifera yields a fine white fibre, used in the Shan States of Burma for making a coarse paper.

Asclepiadaceæ.

The well-known shrubs *Calotropis gigantea* and *Calotropis procera* belonging to this Order yield valuable fibres. They are found generally growing in dry tracts and on sandy river-beds in Rajputana, Sind, the Deccan, Central Provinces and Carnatic country. The stem yields a fine white silky fibre, very strong, which does not perish in water, used for making twine and string, extensively used in Sind for fishing-nets, and elsewhere for fishing-lines, bow-strings, nooses, traps, gins and such like purposes. It is a fibre that has not been as yet sufficiently exploited.

Another important fibre-yielding plant of this Order is *Marsdenia tenacissima*, found in the sub-Himalayan tract, from the Jumna to Nepal, extending to Chota Nagpur and the Behars, in Chittagong and Upper Burma, the fibre of which is used for preparing bow-strings by the Sonthals (Gamble), being extremely strong.

Various other bast-fibres

Other fibres yielded by shrubs or creepers and belonging to this order are *Dregea volubilis*, *Orthanthera viminea* and *Cryptolepis Buchanani*, etc

A strong red fibre, stripping off the tree in thin broad bands, is yielded by *Careya arborea*, and used for cordage and tying carts and rafters. *Cordia Myxa* and *Cordia Rothii*, both yield bast-fibres used in rope-making. *Kydia calycina*, a small tree of most Indian and Burman forests, yields a strong fibre, used for elephant drag-ropes in North Kanara. *Thespesia populnea* of the coast forests of India, Burma and Chittagong gives a strong fibre, though only used locally. *Moringa pterygosperma*, *Albizzia odoratissima*, *Erythrina suberosa*, *Odina Wodier*, *Cerbera Odollam*, *Anodendron paniculatum*, *Miliusa velutina*, *Smilax prolifera*, *Berrya Ammonilla* and a number of other trees and shrubs yield fibres of a somewhat indifferent character, and are only used locally.

(c) *Flosses.*

Several trees and shrubs found in the forests yield flosses known on the market as "Kapoks" and used for upholstery work, such as stuffing pillows and mattresses. Lately a German firm claims to have solved the difficulty of making thread suitable for textile work from "Kapok"; this, if true, should lead to the extensive cultivation of floss-yielding trees.

Bombax malabaricum.

The best known species yielding floss is the Semul or Cotton-tree, *Bombax malabaricum*, found scattered throughout the deciduous forests of India and Burma, being especially common in parts of Eastern Bengal and Assam and in Burma. The pod yields a silky cotton, not very long, but soft and strong The value of Kapok varies from Rs 8 to Rs. 20 per maund of 80 lbs, according to quality.

Enquiries.—Enquiries for Kapock should be made of any of the Conservators of Forests in India and Burma, and especially of the Chief Conservator of Forests, Burma, Maymyo, and the Conservator of Forests, Eastern Circle, Eastern Bengal and Assam, Shillong.

Cochlospermum gossypium

Another species which yields "Kapock" is the Guneri tree, *Cochlospermum gossypium*, a moderate-sized deciduous tree, found in the Western Himalayas, at low elevations, in Guzarat, Central India, the Deccan and the Prome District in Burma.

Calotropis spp. yielding Kapok.

Calotropis gigantea and *Calotropis procera*, both yield a silky shining fibre obtained from the seed. Both are small bushes, occurring in the Punjab, Sind, Rajputana, the Gangetic plain, Central India, Central Provinces, the Deccan, parts of South India and Burma; generally found in dry localities The trade in this very useful floss has somewhat declined in the past, though the Imperial Institute experts think that good quality *Calotropis* floss would fetch 4*d.* to 5*d.* per lb. in the English market

Other floss-producing trees, shrubs and climbers.

There are several other floss-producing trees, shrubs and climbers, such as *Salix daphnoides*, a large shrub or small tree of the Western Himalayas, *Populus ciliata*, a deciduous tree of the Himalayas from Kashmir to Bhutan, found at elevations above 4,000 feet, *Beaumontia grandiflora*, a gigantic climber of the Eastern Himalayas, ascending to 4,000 feet, also found in Chittagong and Sylhet, *Cryptolepis Buchanani*, a climbing shrub found in most forests of India, *Æchmanthera Wallichii, Holarrhena antidysenterica, Wrightia tomentosa, Nerium odorum* and others.

2. GRASSES OTHER THAN OIL-GRASSES

(*a*) *Fibre Grasses.*

Munj-grass.

The two most important species of grasses yielding fibre useful for paper-making, mats, cordage, chicks, basket-making and similar purposes are the Munj-grass, *Saccharum arundinaceum* and Bhabar or Sabai grass, *Ischæmum angustifolium.*

Munj is a reed-like grass with a yellow, long, straight stem, found on the bank of rivers and tanks and in low-lying localities. It occurs in the plains of India and in the lower hills, the culms being extensively used for mat-making, baskets, chicks, thatching purposes, stools, chairs and screens. The sheath yields a fibre used in preparing ropes and cordage.

As a single example of outturn it may be stated that in the Punjab forests in 1908-09, Munj and Sara (*Saccharum procerum*) were sold over some 170,000 acres for Rs. 6,317, besides which permits were issued for the removal of this product, amounting to Rs. 90

Enquiries.—Enquiries for this grass should be made of any of the Conservators of Forests in India proper.

Bhabar or Sabai-grass.

Bhabar grass is extremely fibrous and strong, retaining its green colour for a considerable time after being cut. It occurs in great quantities in Bengal, Chota Nagpur, the Nepal Terai, parts of the Central Provinces and Central India, in the United Provinces, in Rajputana, the Punjab, extending into Afghanistan, generally growing on the warmer slopes and on steep hill-sides. Its chief use is for paper-making, though it is also used in the preparation of coarse ropes and cordage. As a paper-pulp material it may be said to hold, at present, the first place in India, as up to 50,000 tons of the grass finds its way annually to the Indian paper-mills. The principal localities supplying the grass to paper-mills are Bengal, the United Provinces, Central Provinces, and the Nepal Terai As an illustration of outturn it may be stated that in 1908-09 the Bengal forests turned out 3,294 tons of this grass, valued at Rs. 24,094 in the forest.

Enquiries—Enquiries for Bhabar grass should be directed to the Chief Conservator of Forests, Central Provinces, Nagpur; the Conservator of Forests, Bengal, Darjeeling; the Conservators of Forests, Eastern and Western Circles, United Provinces, Naini Tal; and to the Conservator of Forests, Punjab, Lahore.

(*b*) *Thatching Grasses.*

Thatching grasses.

A great variety of thatching grasses are found in the forest, amongst which may be mentioned *Andropogon contortus* (the spear-grass), *Imperata arundinacea*, *Saccharum Narenga*, and many others. To illustrate some of the localities from which thatching grasses are at present exploited. it may be stated that in 1908-09, 3,213 tons were exploited from the Reserved and Protected Forests of Bengal; 1,788,101 bundles, 264,850 cubic feet, and 305,984 tons, valued at Rs. 30,877, from the Reserved and Unclassed State Forests in Eastern Bengal and Assam ; 17,840 tons, valued at Rs. 12,521, from the Southern Circle, Central Provinces, while 919 tons, valued at Rs. 3,076, were removed by Government agency and a large quantity, valued at Rs. 19,821, by purchasers in Madras. There was also a large sale in other provinces, but the approximate figures are not available.

Enquiries.—Enquiries for thatching grasses should in all cases be made to the Conservators of Forests, or local Forest Officers throughout India.

(c) *Grazing and Fodder Grasses.*

Grazing.

The amount of fodder-grass available for cattle from State Forests is enormous, and often in times of scarcity the forests are practically the only localities where grass is obtainable

In 1907-08, 10¼ million horned cattle and 4¾ millions of browsers were afforded grazing in State Forests, the amount realized being about 40 lakhs of rupees.

Fodder grasses.

The largest grass centres are the Central Provinces, and especially the Berars, Nimar and Betul, the Central Circle of the Bombay Presidency and the three Circles of Madras. Other Provinces also supply large quantities of fodder but to a lesser extent than the above named localities.

To illustrate the estimated value of grass fodder either sold or given free from all classes of forests, the following figures have been taken from various Administration Reports for the year 1908-09 :—

Locality.	Value of fodder sold or given free.
Two Circles of the Central Provinces	88,189
Berar Circle	1,67,202
Nimar and Betul	14,932
Punjab	2,49,246*
Bengal	4,335
United Provinces	2,05,802*
Madras	7,93,921*
Bombay	4,45,786*
Ajmer-Merwara	9,130

* Includes grazing fees.

(d) *Other Fibrous Products.*

Khas-khas. *Vetiveria zizanioides*, yielding the khas-khas roots of commerce, is found throughout India, generally growing on the edge of tanks and streams. The roots are used in preparing khas-khas tatties, the stems being used for thatching and preparing an inferior grade of paper.

Korai. *Cyperus tegetum* (Korai), a sedge, found in most parts of India, the culms of which are used for mat-making It is sold annually by the Forest Department in the Madras Presidency.

Enquiries.—Enquiries for Korai should be made of the Conservators of Forests, Southern Circle, Coimbatore, and Northern Circle, Waltair.

Reeds. Various species of reeds are sold annually in different parts of India by the Forest Department. For instance "Sur" reeds (*Phragmites* spp) are sold annually in Sind, the contracts for 1908-09 were given for Rs. 1,830 in Sukkar, Rs. 1,132 in Naushahra, and for Rs. 665 in the Jariack Division.

In Eastern Bengal and Assam annual contracts are given and free grants made for cutting reeds, the amount extracted from Reserved and Unclassed State Forests during 1908-09 being 2,499,934 bundles, valued at Rs. 75,496, and 320 tons, valued at Rs. 279.

Enquiries.—Enquiries for reeds should be made of the Conservator of Forests, Eastern Bengal and Assam, Shillong, and of the Conservator of Forests, Sind, Hyderabad.

3. DISTILLATION PRODUCTS.

The various distillation products obtained from the wood, fruit, leaves, and grasses growing in the forests comprise such products as cutch, wood-oils, charcoal, grass-oils, and extracts such as camphor, Mohwa-liquor, cinnamon-oils, etc., some of which yield considerable revenue to the State, being in much demand.

(a) *Grass-Oils.*

Rosha grass-oil. The most important oil-grasses are the "Rosha" grass, *Cymbopogon Martini*, and the "Lemon" grass, *Cymbopogon citratus*, both yielding perfumed oils.

Rosha-grass, *Cymbopogon Martini*, occurs chiefly in the Central Provinces, Nimar, Berars, and the Khandesh Satpuras of Bombay. Its occurrence is generally local, but where present it forms a dense undergrowth in the forests. Several varieties of this grass are to be found, the two most important bearing the vernacular names of "Motia" and "Sofia." The distillation of the oil is usually left to contractors; sometimes it is carried out by villagers, chiefly in the Betul, Hoshangabad, Mandla, Seoni, Nimar and Ellichpur districts of the Central Provinces and Berar, and in the North and West Divisions of Khandesh, in the Central Circle of Bombay.

The oil finds its way in large quantities to Bombay for export to Europe. Watt states that some 50,000 lbs. are exported annually. The oil fetches 6 to 9 shillings per lb., according to quality.

Outturn—The grass is sold to contractors by the Forest Department, the sales generally taking place in July and August. The amount of oil extracted from grass grown inside the forests is not known. To illustrate rates paid for contracts to extract the oil, the following figures have been taken from Administration Reports:—in 1908-09, in the Central Provinces, Northern Circle, Rs. 312; in the Berars Rs. 9,214; Nimar and Betul Rs. 7,395, and Khandesh Rs. 5,057.

Enquiries.—Enquiries regarding the supply and purchase of Rosha-grass should be made of the Conservator of Forests, Northern Circle, Central Provinces, Jubbulpore; the Conservator of Forests, Berar Circle, Amraoti; and of the Conservator of Forests, Central Circle, Bombay Presidency, Poona.

Lemon-grass oil.

This grass occurs chiefly in South India, and produces what is known on the market as "Travancore Lemon grass-oil," used in perfumery work, such as scenting soap. There appears to be some doubt, from a botanical point of view, as to which plant yields this oil, it generally being supposed to be obtained from *Cymbopogon citratus*, while *Cymbopogon flexuosus* yields the "Malabar or Cochin oil." Watt gives the price of this oil in 1904 as 9*s*. 6*d*. per lb. No data are available from the records as to its sale by the Forest Department though Cochin State exported 4,533 cases in 1907, the value being given as low as 3 annas per oz.

In Travancore it sells at Rs. 10 per bottle containing 36 oz., and the value of the quantity exported is put at Rs. 50,000.

In the English market the quotations in June 1910 were 2¾*d*. to 3*d*. per oz.

(*b*) *Wood-Oils.*

By distillation certain woods yield wood-oils (as distinct from exuded products). The most important, from a commercial point of view, are

Sandal-wood oil and Agar oil, while the Deodar, Teak and certain Pines yield tarry substances of economic value, especially the first named.

Sandal-wood oil. Though Sandal-wood is found chiefly in Mysore and to a smaller extent in the south of British India, the extraction of the oil is carried on outside these producing areas, to a very large extent in Oudh.

The great Sandal-producing areas are North Coimbatore, North and South Arcot, North and South Salem, Cuddapah, Bellary, and the Nilgiri districts of Madras, Nasik, Dharwar, Nagar, Belgaum, Bijapur and South Kanara districts of Bombay and the Mysore, Coorg and Kolhapur States. For prices and outturn of Sandal-wood, see pages 89 and 90.

Enquiries.—Enquiries for Sandal-wood should be made of the Conservators of Forests, Southern Circle, Belgaum and Central Circle, Poona, Bombay Presidency; the Conservators of Forests, Southern Circle, Coimbatore, Central Circle, Madras, and Northern Circle, Waltair, Madras Presidency; and the Chief Forest Officers of Mysore and Coorg.

Agar-agar oil. Agar-agar oil is obtained from the wood of *Aquilaria Agallocha*, the "Eagle" or "Agar" tree of Bhutan, Assam, Khasia Hills, Eastern Bengal and parts of Burma Only very small portions of the tree are found to yield the highly resinous wood, containing the aromatic juice from which the drug is obtained. The oil extracted from the wood is known as "Agar-attar," and is used as a scent. The portions impregnated with this oleo-resin are burnt as incense.

Outturn and prices—The wood is sold annually by the Forest Department in Eastern Bengal and Assam on permits and also on contract. Thus in 1908-09, 22 basket loads were sold on permits for Rs. 32, purchasers bought 149 cwts. for Rs. 1,241, and leases to exploit the wood were given to a value of Rs. 2,241.

Enquiries.—Enquiries for Agar-wood should be made of the Conservators of Forests, Eastern and Western Circles, Eastern Bengal and Assam, Shillong.

Other wood-oils. *Cedrus Deodara*, from which is obtained a black oil, smelling strongly of tar, is used in skin diseases, for fly-bites, and in cases of rheumatism. Looking to the enormous waste occurring in the conversion of Deodar sleepers and also to the richness of this tar-oil, there would appear to be an opening for the preparation of this oil on commercial lines. Teak yields a tar-oil, but it is only prepared locally, while Chir and Kail tar are prepared in the same way as Deodar oil. They are generally procurable in the Bazaar, especially in those adjacent to forests in which the species are found.

(c) *Miscellaneous Products of Distillation.*

Cutch and Kath.

Probably the most important minor products extracted from the State Forests are Cutch and Kath, which are obtained by boiling *Acacia Catechu* chips, their uses being too well known to require description. The tree is found in deciduous forests throughout India and Burma, the chief Cutch-producing localities being the Tharawaddy, Minbu, Yaw, and Pyinmana Divisions of the Pegu Circle in Burma; the Kumaun, Gonda, Pilibhit and Bahraich Divisions of the United Provinces; the South Kanara Division of Madras, where Cutch is prepared departmentally; and to a lesser extent Bengal, Assam, the Central Provinces and Southern Circle of Bombay.

In some localities the right to prepare Cutch and Kath is farmed out annually; in others this produce is prepared departmentally and sold in the large centres of consumption.

Outturn and prices.—To illustrate the approximate outturn and prices at which contracts are given. or the product is sold in various parts of India and Burma, the following figures have been taken from the Administration Reports of 1908-09:—

Locality.	Outturn.	Value.
	Tons.	Rs.
Burma, chiefly from the Pegu Circle .	3,669	91,056
United Provinces, chiefly from Kumaun, Gonda, Pilibhit and Bahraich Divisions.	2,608	10,132
Madras, South Kanara Division. . .	21	12,237
Central Provinces	Not known.	1,680
Bengal	21	1,600
Bombay	Not known.	2,781

Prices.—A noticeable feature of the above figures is the high price obtained for the Cutch, carefully prepared by departmental agency at Wandse in the South Kanara Division of the Madras Presidency, which Cutch sells for Rs 600 per ton. In Cawnpore the ruling prices for Kath are from Rs. 15 to Rs. 20 per maund of 82 lbs., and in Lucknow Rs. 25 per maund is the price given for the best qualities. In Bundelkhand the price given is from Rs. 15 to Rs. 20 per maund of 82 lbs.; in Sambalpur Rs. 10 per maund of 82 lbs., while in Burma it sells, at Bhamo, from Rs. 24 to Rs. 30 per cwt., and in Prome for Rs. 30 per cwt.

Enquiries.—Enquiries as to the Cutch contracts or sales of the products, when it is prepared departmentally, should be made of the Conservator of Forests, Pegu Circle, Burma, Rangoon; the Conservator of Forests, Eastern Circle, United Provinces, Naini Tal; the Conservator of Forests, Southern Circle, Madras, Coimbatore; the Conservator of Forests, Bengal, Darjeeling; the Conservator of Forests, Southern Circle, Bombay, Belgaum; and of the Chief Conservator of Forests, Central Provinces, Nagpur.

Charcoal. Charcoal is manufactured all over India and Burma from a great variety of woods, different species being used according to the use for which the charcoal is intended.

The work of preparing charcoal is generally carried out by a contracto· or by persons having either the right or privilege to do so The manufacture of charcoal is generally a local trade, so that a detailed description of the various methods of preparing the same and the possible outturn are not here given. Any further reference as to outturn and contracts should be made to local Forest Officers. For information as to the various methods of preparing charcoal, Troup's Forest Utilization, pages 210 to 221, may be consulted.

Camphor. The world's supply of camphor chiefly comes from Formosa, Japan and China, and recently attempts have been made to cultivate the camphor tree in Ceylon and in Indian and Burman forests, though at present on no large scale.

Cinnamomum Camphora, the true camphor tree, is being cultivated with success in the more temperate parts of Burma, for instance it is stated to be doing well in the Upper Chindwin, Myitkyina and Bhamo districts.

There are, however, certain camphor-yielding trees found growing naturally in the State Forests; amongst others may be mentioned *Blumea balsamifera,* found in the Shan State of Burma, from the leaves of which the Shans prepare a camphor.

Cinnamon-oil. In North and South Kanara and Malabar cinnamon-oil is prepared to a limited extent from the leaves of *Cinnamomum zeylanicum* and used by Arabs in flavouring curry. In South Canara, at Kundapur, this oil sells for Rs. 2 per lb. *Cinnamomum Tamala* is found in the Himalayas from the Sutlej to Bhutan, from the leaves of which an oil is distilled used in flavouring sweets and in confectionery.

Mohwa liquor. The corolla of the Mohwa flower, *Bassia latifolia,* is distilled, generally under Government supervision to obtain the well-known

Mohwa liquor. The preparation of this liquor only concerns the Forest Department indirectly, as the corollas are nearly always collected free by privilege and right-holders, who either sell them to the Government distilleries or utilise them as food. To facilitate the collection the villagers not infrequently burn the ground under the trees and so set fire to the State Forests.

4. OIL-SEEDS.

A very large number of forest trees bear seeds yielding oil, some of which are already of commercial importance, and others, owing to the richness and quality of the oil they yield, deserve the further attention of the commercial community.

Outturn.—It is here only possible to mention a few of the most important oil-yielding seeds about which information as to outturn and prices is available. So as to give enquirers an idea of the localities, approximate outturn and possible uses of the various seeds, it will be convenient to tabulate the information as follows :—

Name of tree from which the seed is obtained.	Localities where the species occurs.	Approximate quantity available.	Approximate rates of collection, excluding royalty.	Uses.
	UNITED PROVINCES.	Cwt.	Per cwt. *Rs a. p.*	
Bassia latifolia, (Mohwa.)	1. Gorakhpur Division	35	1 6 5	The oil known as Mohwa butter is used all over India for adulterating ghee; it is also very extensively eaten. It is used largely for soap-making. Considerable quantities of the seed are exported to Europe for preparing oil-cake. Watt states that the exports stand at 500,000 cwt., and further says that apparently the only limit to the uses of the oil is the want of enterprise in extending the production. The price of *Bassia* butter in the Calcutta market is at present about Rs 7-8 to Rs. 8 per maund of 82 lbs. * A very high estimate.
	2. Kheri Divn.	55	Very expensive. Re. 1 to Rs. 2	
	3. Bahraich Divn.	1,400		
			Rs. a. p	
	4. Kumaun Divn.	126	7 0 0	
	5. Gonda Divn.	50	1 14 0	
	CENTRAL PROVINCES.			
Ditto . .	1. Narsinghpur Divn.	240	1 6 0	
	2. Balaghat Divn.	700	3 13 0	
	3. S. Chanda Divn	535	4 3 0	
	4. N. Chanda Divn.	3,576	2 12 0	
	5. Nagpur Wardha Divn	350	2 15 0 3 3 0	
	6. Chindwara Divn.	7,000	4 14 0	
	7. Bhandara Divn.	350	4 9 0	
	8. Buldana Divn.	4,000	*8 12 0	
	9. Betul Divn.	600	2 1 0	
	10. Akola Divn.	140	1 6 0	
	11. Raipur Divn.	1,600	2 12 0	
	12. Melghat Divn.	480	2 0 0	
	13. Damoh Divn.	360	4 11 0	

Name of tree from which the seed is obtained.	Localities where the species occurs.	Approximate quantity available.	Approximate rates of collection, excluding royalty.	Uses.
	BOMBAY.	Cwt.	Per cwt. *Rs a. p.*	
Bassia latifolia (Mohwa.)	Central Circle .	The seed is collected departmentally in the Central Circle: 466,086 lbs. or 4,340 cwt. were collected in 1908-09.	The value of the amount collected was Rs. 26,000 or Rs. 6 per cwt.	
Ditto .	Northern Circle	The South Thana District could yield 98,000 lbs. of seed per annum, or 875 cwt.	4 1 0	
Bassia butyracea .	UNITED PROVINCES.	70 Cwt.	Rs 5 to Rs. 7 per cwt. Sold in the bazar for Rs. 7 to Rs. 8 per maund of 82 lbs.	Used for similar purpose to that of Mohwa butter.
Schleichera trijuga, (Kosum.)	1 Kumaun Divn.	120	8 3 0	A yellow oil is obtained from this seed, which has recently been tested for soap-making by a large firm in India and pronounced as most suitable for the purpose, after having been rectified. It is also a useful hair-oil, said to be the basis of Macassar hair-oil
	2. Kheri "	50	Expensive.	
	3. Gonda "	40	*Rs. a p* 2 1 0	
	CENTRAL PROVINCES.			
Ditto .	1. Balaghat Divn.	140	8 0 0	
	2. Raipur Divn.	1,000	4 3 0	
	3. N. Chanda Divn.	70	Price not known.	
	4. S. Mandla, Divn.	130	*Rs. a. p.* 4 0 0	
	5. Betul Divn.	40	2 8 0	
	BURMA.			
Ditto . .	1. Prome Divn.	Quantity not known.	Rs 10 per 80 lbs.	The seed sells at about Rs. 22 per cwt. in the Calcutta market.
			Per basket. *Rs a p.*	
	2. Pyinmana Divn.	1,000 baskets .	0 8 0	
		Cwt.	Per cwt. *Rs. a p.*	
	3. Toungoo Divn.	120	10 0 0	
	4. Shwegyin Divn	700	12 8 0	

Name of tree from which the seed is obtained.	Localities where the species occurs.	Approximate quantity available.	Approximate rates of collection, excluding royalty.	Uses.
	EASTERN BENGAL AND ASSAM.			
Mesua ferrea (The Iron-wood tree.)	Eastern Circle	14—18 tons	Rs 7 per md of 82 lbs. on station, exclusive of royalty.	The kernels yield as much as 70 per cent. of very rich red-brown clear somewhat perfumed oil, which might be used for confectionery. The oil is used medicinally as an embrocation and for applying to sores.
	BURMA		Per basket. Rs a p	
Ditto	1. Mandalay Divn.	100 baskets	1 8 0	
			Per cwt Rs a p	
	2. S. Tenasserim Divn	8 cwt	20 0 0	
	Andamans	Not known, but a fair supply.	Not known	
	CENTRAL PROVINCES.		Rs. a. p	
Pongamia glabra	1. N. Chanda Divn.	70	2 7 0	The seed yields a yellow-brown oil used for burning. It is also said to have marked antiseptic properties The oil sells in Calcutta at about Rs. 11 per cwt.
	2. Buldana Divn.	1,000	8 12 0	
	MADRAS.			
Ditto	1. N. Malabar Divn.	20	2 8 0	
	2. N Arcot Divn.	200	2 8 0	
	3. N. Coimbatore Divn.	360	1 8 0	
	BURMA.		Per basket Rs a p	
Celastrus paniculata	1. Mandalay Divn.	500 baskets	1 8 0 2 0 0	The seed yields a deep orange-coloured oil, used medicinally for external application. By destructive distillation and when mixed with benzoin, cloves and mace, the *Oleum Nigrum* of pharmacy is obtained.
		Cwt.	Per cwt. Rs a p.	
	2. Ruby Mines Divn.	1	4 8 0	
	CENTRAL PROVINCES.			
Ditto	1. Hoshangabad Divn.	2	4 3 0	
	2. Narsinghpur Divn.	2	4 10 0	
	3 Jubbalpur Divn.	2	7 0 0	
	4. Balaghat Divn.	17	8 0 0	
	5. N Chanda Divn	70	5 4 0	
	6. S. Chanda Divn.	20	Not known.	
			Rs. a. p.	
	7. Akola Divn.	14	1 7 0	
	8. Mandla Divn.	80	3 9 0	
	9. Betul Divn.	2	2 2 0	
	10. Damoh Divn.	10	6 14 0	
	UNITED PROVINCES.			
Ditto	1. Kumaun Divn.	7	4 3 0	
	2. Gorakhpur Divn.	5	2 12 0	

Name of tree from which the seed is obtained.	Localities where the species occurs.	Approximate quantity available.	Approximate rates of collection, excluding royalty.	Uses.
		Cwt.	*Rs a. p*	
Prunus eburnea .	Baluchistan .	6,000 lbs. available.	Rs 2 per maund of 80 lbs on Mangi or Khanac stations, N W Railway, exclusive of royalty. Freight to Karachi Re 1-5 per cwt.	The oil obtained from the seed resembles that of almond oil The kernels yield 11 per cent of oil
	BOMBAY.			
Diospyros montana	Southern Circle	586	Rs. 14 per cwt at a port on the West Coast such as Karwar.	

The above are only a few of the oil-seeds obtained from forest trees ; of others may be mentioned *Shorea robusta*, yielding Sal butter ; *Juglans regia*, the Walnut tree, from which walnut oil is obtained ; *Calophyllum Inophyllum* seed, the oil from the seeds of which is used for burning and mixed with *Vateria indica* resin for caulking boats ; *Anacardium occidentale* seed, the oil of which mixed with charred coir is used as varnish ; the pericarp of *Semecarpus Anacardium* yields a powerful astringent, used in marking ink ; *Prinsepia utilis* seed, extensively used for cooking, *Vateria indica* seed yields piney-tallow, or vegetable butter ; *Mimusops Elengi, Melia indica, Bombax malabaricum* and *Buchanania latifolia* oils are used for burning. The wax round the seed of *Sapium sebiferum* yields Chinese tallow, used for making candles, while *Jatropha Curcas* seed oil is used medicinally and for burning.

Enquiries.—It must be understood that the figures given above for prices and possible yield are only estimates, and that the Divisional Officers are in no way bound down to the rates and prices given ; the figures are simply meant as a guide to possible enquirers. The enquiries for seed should be made either of the Conservators or the Divisional Forest Officers, according to the respective Divisions enumerated in the list. As the seed in most cases is not collected departmentally, it would be well for enquirers, when addressing the local officers, to request them to name reliable contractors who would carry out the work of collecting the seed and possibly express the oil locally if called upon to do so.

5. TANS AND DYES.

(a) *Tan-Barks.*

Acacia arabica bark.

A large number of forest trees yield tan-barks, some of them of great value, others though containing the necessary tanning properties also contain colouring matter, which is objected to by tanners. There exists at present no tan-extract factory in India using barks as raw material, though a Government Factory has been established at Rangoon in Burma for preparing extracts from such barks as that of *Rhizophora mucronata.* The difficulty lies in removing the objectionable dyes from the bark, which, it is hoped, will be overcome after the experiments now being prosecuted in this direction are completed.

The most important bark now used by tanners, especially in Northern India, is Babul bark, obtained from the Babul tree, *Acacia arabica.* The tree is found in forests, in waste and cultivated lands. The chief Babul areas are in Sind, in the Hyderabad Juruck, Naushahra and Sukkur Divisions, the total area being computed at 172,000 acres; in the Berars it is found extensively in the Amraoti, Akola and Buldana Divisions, where 14,600 acres of Babul forest occur; in the United Provinces it is found chiefly scattered all over the waste and cultivated lands in considerable quantities, and the same is the case in Guzarat. In Bombay, 45,000 acres are under Babul, chiefly in the East Khandesh, Ahmednagar, Sholapur, Poona and Nasik Districts.

The bark is generally obtained from felled trees, so that a large supply is obtainable from the Government forests in the above-mentioned areas, where regulated fellings take place annually. It has been found that stripping standing trees is not advisable, as the wounds so caused heal but slowly, or not at all.

There is a difference of opinion as to whether bark from old or young trees is best for tanning purposes English tanners appear to favour bark from young trees, whereas native tanners maintain that bark from old trees contain a greater percentage of catechu tannin.

Outturn and prices.—It is stated that Cawnpore tanneries alone consume 500,000 maunds of bark annually, but that the local supply is fast declining, and that they now have to import it from considerable distances, and go as far afield as 150 miles to obtain their supplies.

As regards outturn of bark from the various Babul areas, the figures available besides being only to hand for a few localities, must necessarily be approximate only, as the yield varies from year to year. In Poona it is estimated that 357 tons are available annually, of which ¾ths come from forests and ¼th from "Malki lands," its value being Re. 1-2-0 per maund of 80 lbs. From Hyderabad, Sind, the outturn is about 2,054 tons, valued at Rs. 80 per 100 maunds. In other localities the amount of bark available is not known, but it must be considerable as may be gathered from the following table showing the areas under Babul forest .—

Circle.	Division.	Area in acres.
BOMBAY.		
Central Circle	East Khandesh . . .	4,220
	Nasik	1,910
	Ahmednagar and Sholapur	25,862
	Poona	12,153
	Satara	923
		45 068
Sind	Sukkur	1,000
	Naushahra	644
	Hyderabad . . .	90,000
	Jarruck	80,000
CENTRAL PROVINCES.		171,644
Berars . . .	Amraoti	7,068
	Buldana	3,467
	Akola	4,067
		14,602

The prices vary in different localities from 10 annas to Re. 1-4 per maund of 82 lbs. In Cawnpore the ruling prices at present are from 13 to 14 annas per maund. Watt states that the bark fetches from 8 annas to Rs. 2-4 per 100 lbs.

Enquiries.—Enquiries regarding Babul bark should be made of the Conservator of Forests, Berar Circle, Central Provinces, Amraoti; the Conservator of Forests, Central Circle, Bombay, Poona; and the Deputy Conservator of Forests in charge, Sind Circle, Hyderabad. It must be remembered. when addressing the Conservators in this connection.

that Babul trees are generally sold standing to contractors, so that enquiries should be made as to the names of the contractors exploiting the annual felling areas, and as to dates fixed for the sale of these contracts.

Cassia auriculata bark.

A bark of nearly equal importance to Babul is that obtained from a shrub called *Cassia auriculata*, yielding the Tarwar bark; indeed in Southern India tanners prefer this bark to that of Babul, while the Cawnpore tanners state that the tannin from this bark penetrates the hides quicker than that of other barks, though it cannot well be used alone in tanning hides.

The shrub is found in Southern India, extending northwards to Rajputana; it is also found in the Shan hills of Burma, and has been cultivated to a small extent at Cawnpore by one of the large tan factories. In the latter connection it may be stated that its cultivation presents no difficulties, young plantations only wanting weeding. It yields in the 2nd and 3rd year if irrigated, and in the 4th and 5th if not irrigated.

Outturn and prices.—The outturn in Southern India is very considerable, it being a common shrub in parts of the Dharwar and Bijapur districts of the Southern Circle, Bombay, and common in the drier parts of Madras. For instance in the Southern Circle, the Tarwar farm, which is put up to auction annually, realized Rs. 2,135 in 1907-08, while in Madras *Cassia auriculata* together with *Ventilago madraspatana* and other barks and fibres realized Rs. 1,58,732 in 1908-09. In Cawnpore the bark fetches from Re. 1-8 to Rs. 2-4 per maund of 82 lbs.

Enquiries.—Enquiries for Tarwar bark, and the sales of the same, should be addressed to the Conservator of Forests, Southern Circle, Bombay, Belgaum, and to the Conservators of Forests, Southern Circle, Coimbatore, Northern Circle, Waltair, and Central Circle, Madras, Madras Presidency.

Cassia Fistula bark.

Sunari bark obtained from *Cassia Fistula* has not so good a reputation for tanning as that of *Cassia auriculata*, though also extensively used for the purpose.

The tree has a very wide distribution, being found all over India, Burma and Ceylon, and commonly known as the Indian laburnum. The bark is used in South India and also at Cawnpore for tanning Gamble states that in South India the exploitation of this bark has in cases led to considerable damage to the forests.

Outturn and prices.—The right to collect the bark is sold annually by the Forest Department Though the records to hand in this connection are scanty, in Bengal it is stated, in the Administration Report for 1908-09, that 138 tons were sold for Rs. 855.

Enquiries.—Enquiries as to the sale and disposal of Sunari contracts should be made of the Conservator of Forests, Bengal, Darjeeling, and of any other Conservator in India and Burma.

Mangrove bark.

Certain Mangroves (*Rhizophora* spp.) yield barks rich in tannin; the dye matter is, however, held by tanners to be excessive. To overcome this difficulty experiments are now being carried out at the Government Rangoon Tan Extract Factory. The most important species of this order yielding tans are *Rhizophora mucronata*, a small evergreen tree of the tidal creeks of India, Burma, Arakan and the Andamans, *Ceriops Candolleana* and *Ceriops Roxburghiana*, small evergreen trees of the Sunderbans and tidal creeks of India, Burma and the Andamans.

Outturn and yield.—The bark of the Mangrove is exported to Rangoon from the Tenasserim Circle and used for tanning purposes. The possible outturn is not known; however it may be stated that the revenue from the sale of this and other barks in the South Tenasserim Division in 1908-09 was Rs. 5,485 and from the Andamans 59,655 lbs. were exploited and sold at Rs. 420.

Enquiries.—Enquiries for these barks should be made of the Conservator of Forests, Tenasserim and Pegu Circles, Burma, Rangoon; the Conservator of Forests, Bengal, Darjeeling; and of the Deputy Conservator of Forests, Andamans, Port Blair

Other tan bark.

A variety of other trees yield tan barks, such as *Terminalia tomentosa* (Sain), *Avicennia officinalis* (White Mangrove), *Shorea robusta* (Sal), *Lagerströmia parviflora. Garuga pinnata, Casuarina equisetifolia, Odina Wodier, Acacia Suma, Acacia leucophlœa, Bauhinia purpurea, Rhus mysorensis, Tamarix articulata, Eugenia Jambolana, Cæsalpinia sepiaria,* and many others.

(*b*) *Tan Leaves.*

Certain leaves are commonly employed for tanning hides, though their use is local and they are used only by native tanners. Those most commonly in use are the leaves of the Dhaura tree, *Anogeissus latifolia*, of the Emblic Myrabolam, *Phyllanthus Emblica*, and those of *Lawsonia alba*, a bush yielding both a tan and red dye.

(*c*) *Tan Fruits.*

Of equal importance to the tan barks and yielding greater revenue to the Department are certain fruits, largely used for tanning purposes and preparing tan-extracts.

The most important tan fruits are those obtained from the Hirda or Harra tree, *Terminalia Chebula,* known on the market as Chebulic myrabolams. The tree occurs in Madras, Bombay, the Central Provinces, Bengal and Northern India, as also in Burma. The chief supplies are obtained from the three first mentioned localities. In the Central Provinces, the Mandla, Balaghat, Raipur and Jubbulpore Divisions export large quantities of myrabolams; in Bombay this species is chiefly found in the Thana, Nasik, Nagar, Khandesh, Poona, Belgaum, Satara, and Surat districts, and in Madras in the drier localities, Bimlipatam being a large exporting centre.

Myrabolams.

Myrabolams are used in India for tanning, and are also largely exported to Europe for the same purpose. Up to the present the exports have chiefly been made in the shape of the dried fruit, though a factory for preparing the extract exists at Raneegunge, which turns out and exports about 1,000 tons annually. The cost of exporting the fruis in the crude state is enormous, and there should be a further opening for the preparation of this tan extract; the only obstacle to such an industry appears to be a certain prejudice against extracts on the part of English tanners, due to adulterated products having been put on the market from abroad

Outturn and prices.—The export of myrabolams from India in 1907-08 amounted to 74,665 tons, valued at Rs 58,95,246, or Rs. 79 per ton. Of this large amount, part was obtained from State Forests and the rest from Revenue lands in British India and from the Native States.

The amount realized in 1908-09 by the sale of Hirda nuts from the Northern Circle of the Central Provinces was Rs. 10,834 and in the Balaghat Division of the Southern Circle a three years' lease was given to collect this produce for Rs. 50,000.

In the Central Circle of Bombay, Hirda nuts are either exploited departmentally and sold to the highest bidder, or collected by contractors; thus in 1907-08, Rs. 21,296 was the revenue derived from this source; in the Southern Circle the right to their collection is farmed out on lease, the amount realized in the same year being Rs. 23,082.

The price of Myrabolams, besides varying from year to year according to the state of the crop, also depends on the class of myrabolams: for instance, the recent prices for the class known on the market as 'Bhimlies' was 5*s*. 3*d*. to 6*s*. 6*d*. per cwt., for 'Jubbelpores' 5*s*. to 6*s*. per cwt., and for 'Rajpores' 4*s*. 9*d*. to 5*s*. 8*d*. per cwt.

Enquiries.—Enquiries as to the sale of myrabolams should be made of the Chief Conservator of Forests, Central Provinces, Nagpur; of the Conservators of Forests, Central Circle, Poona, and Southern Circle, Belgaum, Bombay Presidency; of the Conservators of Forests, Northern Circle, Waltair, Southern Circle, Coimbatore, and Central Circle, Madras, Madras Presidency, and of the Conservator of Forests, Bengal, Darjeeling.

Babul pods. The pods of *Acacia arabica* are used in tanning partly on account of the tannin properties they contain, but to a greater extent on account of the good colour they give to leather Their use is generally local, and they are not at present exported to Europe.

Outturn and prices —The largest outturn is obtainable from the Sind forests, from which locality they appear to be exploited in large quantities Thus, in 1908 09, the Forest Department in that Province sold Rs. 19,667 worth of Babul pods. No doubt large quantities are obtainable from the Berars and the Central Circle of Bombay as also from cultivated lands of the United Provinces, where the tree is commonly found growing near water-courses and tanks.

Enquiries —Enquiries as to the sale of Babul pods should be made of the Deputy Conservator of Forests, Hyderabad, Sind; of the Conservator of Forests, Berars, Amraoti; and of the Conservator of Forests, Central Circle, Bombay, Poona.

Emblic and Beleric myrabolams. The other tan-fruits of any importance are Emblic myrabolams, obtained from the Aonla or Awla tree, *Phyllanthus Emblica*, and Beleric myrabolams obtained from *Terminalia belerica.* These are inferior to Chebulic myrabolams, though sometimes mixed with them for tanning.

Divi-divi pods. *Cæsalpinia coriaria*, yielding the Divi-divi pods, is a small tree cultivated in many forests, such as those of the Western Presidency and Malabar. The pods were at first in much favour with tanners, but appear from the record of sales by the Department to have fallen into disfavour of late years.

Goth-bor fruits. The Goth-bor tree *Zizyphus xylopyra*, is a small tree found in most parts of India, the fruit of which is used locally for tanning.

(d) *Wood, Bark, and Root-Dyes.*

Since the introduction of analine dyes the value of the most important dyes obtained from forest products has become of local importance only, though a few still maintain some of their former importance.

Wood-Dyes. Red Sanders, the wood of *Pterocarpus santalinus*, a small tree of South India, yields a strong red dye, formerly largely exported to Europe, but now only used in India. The wood of the Jack tree, *Artocarpus integrifolia*, as also that of *Artocarpus Lakoocha*, when ground to powder or reduced to saw-dust and boiled in water, yields a yellow pigment, used in dyeing cloth.

Root Dyes. *Symplocos* spp. root-wood yields red and yellow dyes, those of *Berberis aristata* and *Morinda tinctoria* yield yellow dyes, *Punica Granatum* yields a red dye, while other root dyes are obtained from various species but are of even less value than those mentioned above, and are only used locally.

Bark Dyes. Many barks yield brown and black dyes, such as *Acacia* spp., *Terminalia tomentosa, Berberis nepalensis, Alnus nitida, Alnus nepalensis, Ventilago madraspatana, Mimusops littoralis*; these and many other barks, though used for dyeing, are also used for tanning, in which industry the dye is often detrimental.

(*e*) *Dye Flowers.*

More important in some ways than root and bark-dyes are those obtained from certain flowers.

Kamela powder. The well-known Kamela powder, obtained from the fruit glands of *Mallotus philippinensis*, a small tree found all over India, is extensively collected and yields a red dye It sells in the Bazar for Rs. 15 to Rs. 18 per maund.

Generally speaking, the Department has neither time nor sufficient staff to collect the powder departmentally, so that enquirers, when addressing the local Forest Officers, should ask for names of contractors or merchants dealing in this product.

Surgi flowers. The flower-buds of *Ochrocarpus longifolius*, known on the West Coast as "Surgi flowers" or "Tambra-Nagkesar," yield a red dye used in dyeing silk. The right to collect these buds is annually farmed out in the West and South Forest Divisions of North Kanara, as also in South Kanara and Malabar.

Enquiries regarding the sale of these flower-buds should be made of the Conservator of Forests, Southern Circle, Bombay, Belgaum, and of the Conservator of Forests, Southern Circle, Madras, Coimbatore.

Other Dye flowers. The pulp surrounding the seeds of *Bixa Orellana* yield the "Ornatto dye" of commerce, with which silks are dyed yellow and red. Native saris and cloths are often dyed yellow with the flowers of the Dhak or Palas tree, *Butea frondosa*, the yellow dyes obtained from the flowers of *Cedrela Toona, Nyctanthes Arbor-tristis* and *Michelia champaca* being used for the same purposes.

6. GUMS, RESINS AND OLEO-RESINS.

Gums, resins, and oleo-resins form an important section of the Minor Forest Products. The gums yielded by many species are not only plentiful but are also largely used for such purposes as mucilage, calico printing, confectionery, and in medicine A few of these gums are exported to Europe, as for instance gum-kino, though by far the greater majority are used in India only.

Resins may be classed into two sections . (*i*) Pine-resins and (*ii*) Resins from broad-leaved species The former are chiefly obtained from the Chir, *Pinus longifolia* the Kail, *Pinus excelsa*, and the East Himalaya and Burma pine, *Pinus Khasya*, from which on distillation the reson yields rosin or colophony and turpentine. Resins from broad-leaved species are sometimes called 'dammars,' though the true dammar comes from a conifer not found in India They are obtained from such species as *Hopea odorata*, *Shorea robusta* (Sal), *Vateria indica* (the Indian Copal tree), *Canarium resiniferum* and *Canarium strictum*, etc , and are used for varnish, caulking boats and ships, for burning as incense, and in medicine.

The oleo-resins consist of resin and volatile oils Some of them, such as Thitsi and Gurjan oil, are of considerable commercial importance and largely utilized as varnish and for caulking the seams of boats

(*a*) *Gums and Gum-Resins*

A very large number of trees found in Indian forests yield gums and gum-resins, of which it is only here possible to mention a few of the most important.

Gum arabic. True gum arabic is obtained from *Acacia Senegal*, a small thorny shrub found scattered sparsely in Sind, the Punjab and Rajputana, its chief habitat being Senegal and the Blue Nile The yield of this valuable gum being very small in India, it does not hold an important place amongst the Minor Products, though its further cultivation might prove commercially successful.

Babul gum. The Babul tree is extensively found in Sind, the Berars and parts of Bombay, its gum being an important commercial product It is extensively used for calico-printing and sizing paper, for fixing paint and whitewash, as a mucilage, and to a limited extent in medicine. It is also eaten and used in preparing sweetmeats. The price varies according to quality and colour by ; large light-coloured tears from Sind babul, used for eating, fetch the highest prices, a fair average price may be taken as 4 annas per lb., while fine qualities fetch as much as 8 annas per lb.

Enquiries.—The gum is not collected departmentally, often the villagers have the right to collect it free, otherwise its collection is farmed out. It can nearly always be purchased in large bazaars Any enquiries as to its collection should be made of the Deputy Conservator of Forests, Hyderabad, Sind; of the Conservator of Forests, Berar Circle, Central Provinces, Amraoti, and of the Conservator of Forests, Central Circle, Bombay, Poona

Gum-kino. An important medical gum is obtained from *Pterocarpus Marsupium,* the Gum-kino tree It occurs in Central and Southern India, found at its best on the Western Ghats, in the Kanara and Malabar districts. The trees are chiefly tapped in order to obtain this gum in South Kanara and North Malabar of Madras, and to a less extent in the Bombay district. The cost of preparing the drug comes to 4 annas to 6 annas per lb. It finds its way to Bombay, and so to England and France, through the sea-coast towns ot Calicut, Tellicherry, Mangalore, Kundapur and Karwar. The price of "Medical kino" in England fluctuates enormously; it has been down to 1 shilling per lb. and and as high at 17 shillings per lb , its price at present being from 10 shillings to 12 shillings per lb.

Enquiries.– Enquiries for "Gum-kino" should be made of the Conservator of Forests, Southern Circle, Madras, Coimbatore, and of the Conservator of Forests, Southern Circle, Bombay, Belgaum.

Katira gum. Amongst many other gums may be mentioned the "Katira gum" obtained from *Cochlospermum Gossypium,* exuding profusely in long streams from the tree. It is of whitish, more or less transparent colour. It is used in medicine and by shoe-makers (Baden Powell).

Mohin gum. *Odina Wodier,* a large tree of the dry forests of India, yields a copious gum, used for fixing whitewash, sizing cloth and paper, and in medicine.

Bengal kino. The Dhak tree, *Butea frondosa,* yeilds a red gum, known as "Bengal kino." It much resembles "Gun-kino," and is used for similar purposes.

Dhaura gum. The Dhaura tree, *Anogeissus latifolia* yeilds a whitish-yellow gum, used extenesively for sizing paper and calico, and as a weak mucilage.

Moringa gum. A curious deep-red gum, exuding from the tree like drops of blood and on coagulating forming a thick hard dark-red mass used in native medicine, is obtained from the *Moringa pterygosperma,* the Horse-radish tree.

Indian Redwood gum. *Soymida febrifuga*, the Indian Redwood or Rohan tree of Central and Southern India exudes a clear transparent gum making into a good mucilage.

Chironji gum. *Buchanania latifolia*, a tree found throughout India and Burma, yields large quantities of gum, which is a good mucilage, and deserves further attention.

Gum of Gardenia spp. *Gardenia lucida*, found in the Peninsula from the Central Provinces southwards, yields a hard, opaque, yellow to greenish brown gum-resin used in cutaneous diseases; the gum-resins of *Gardenia gummifera* is used for similar purposes, and is also edible (Gamble)

Salai or Gugal gum. *Boswellia serrata* gum-resin, of greenish colour, is burnt as incense, having a not unpleasant smell.

Many other guns might be mentioned, but at present they are of little commercial importance.

Enquiries.—The above mentioned gums are obtained from trees which have in most instances a wide distribution, so that enquiries concerning any of them should be directed to any of the local Forest Officers. It may here be mentioned that the Conservator of Forests, Southern Circle, Bombay, Belgaum, or his officers, hold annual sales for the right to collect gums in their forests.

(b) *Resins other than Pine-Resin.*

Indian Copal or Piney Resin or White Dammar. Piney-resin, or White Dammar, is obtained from *Vateria indica*, a large tree of the Western Ghats. It is used for a variety of purposes, but chiefly in preparing varnish Mixed with fish oil or oil from the seed of *Callophyllum Inophyllum* it is used for caulking boats. Gamble says that mixed with cocoanut-oil it is used for making candles.

Outturn.—The outturn is considerable from the North and South Kanara and North and South Malabar Divisions. The prices obtained in the forest for this resin are not known, as it is sold by the Department together with the right to collect other resins and gums. The amount realized for such products from North Kanara in 1908-09 was Rs. 533 and from the Southern Circle, Madras, which includes the areas where this tree occurs, was Rs. 7,743.

Enquiries.—Enquiries for White dammar should be made of the Conservator of Forests, Southern Circle, Madras, Coimbatore, and the Conservator of Forests, Southern Circle, Bombay, Belgaum.

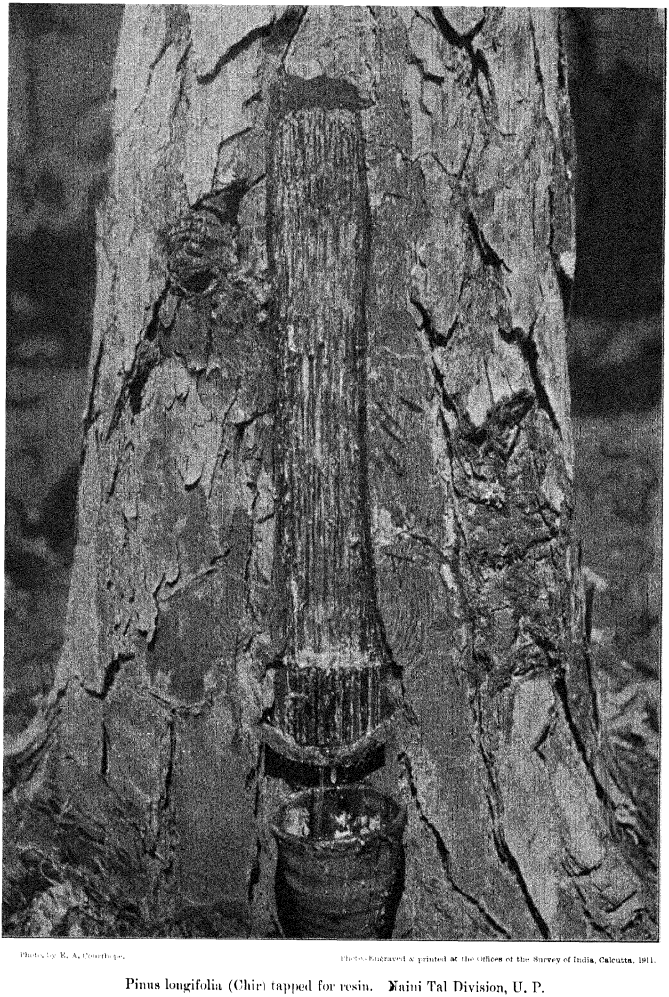


Photo. by E. A. Courthope.

Photo.-Engraved & printed at the Offices of the Survey of India, Calcutta, 1911.

Pinus longifolia (Chir) tapped for resin. Naini Tal Division, U. P.

[to face page 139.

Hopea odorata resin or Rock Dammar.

Rock Dammer is obtained from a large evergreen tree of Lower Burma and the Andamans. It yields a yellow dammar or copal, used as varnish, which is of considerable value

Outturn.—In the Administration Report of the Tenasserim Circle of Burma, 1908-09, it is stated that dammar (probably Rock dammar), was sold in the Western Salween Division, together with Thitsi (an oleo-resin) for Rs. 1,000 and in the Thaungyin Division for Rs 2,700, while in the Ataran Division the dammar alone was sold for Rs. 1,200.

Enquiries.—Enquiries for Rock dammar should be made of the Conservator of Forests, Tenasserim Circle, Burma, Rangoon.

Pwenyet Dammar.

Pwenyet dammar is collected and made up by bees into a funnel-shaped opening at the mouths of their hives. This substance is resinous, black in colour, and is extensively used in Burma for caulking boats.

Outturn.—The annual outturn is not known, but the right to its collection is sold annually by the Forest Department in the Tenasserim Circle.

Enquiries—Enquiries regarding the sale of this dammar should be made of the Conservator of Forests, Tenasserim Circle, Burma, Rangoon.

(c) *Pine-Resin.*

Rosin or Colophony, and Turpentine, Products of Pine resin.

As before stated, the chief sources of pine-resin are from the Chir, *Pinus longifolia*, and the Kail, *Pinus excelsa*, and to a less extent from *Pinus Khasya*. The chief localities where tapping is now carried on are the Jaunsar and Naini Tal Divisions of the United Provinces, in which latter Division there is a Government factory for preparing turpentine and rosin or colophony. The other locality producing resin is the Punjab.

Outturn.—In 1908-09 the Naini Tal factory treated 574 tons of resin, yielding 22,252 gallons of turpentine and 341 tons of rosin. In Jaunsar, 18 tons of crude resin were collected, yielding 1,340 gallons of turpentine and 11 tons of rosin. In the Punjab, in the same year, crude resin was collected and sold for Rs. 8,144. American rosin of "G" class fetches Rs. 8 to Rs. 9 per maund in the Calcutta market, while the price of Indian rosin is slightly less at present, though further refinement will probably bring it up to that of the imported article.

Enquiries.—Enquiries for rosin, turpentine, and crude resin should be made of the Conservator of Forests, Western Circle, United Provinces, Naini Tal, and of the Conservator of Forests, Punjab, Lahore.

(d) *Oleo-Resins.*

The most important oleo-resins are obtained from certain species of *Dipterocarpus*, and from *Melanorrhœa usitata*, and chiefly come from Burma, though "Gurjan oil" is also obtainable from the Andamans and Assam.

Gurjan oil. The oleo-resin is obtained from the Gurjan tree, *Dipterocarpus turbinatus*, a large tree found throughout tropical Burma, Chittagong, Cachar and the Andamans. The oil is largely collected and exported from Burma, and used for painting houses and ships (Gamble). Watt says it is applied to bamboo-work as a preservative; he further states that it has been used in Europe as a varnish with good results, and that it is reported to be a useful ingredient in lithographic ink.

Outturn and prices.—The amount available is large, and Watt, quoting a letter from a Conservator of Forests in Burma, states that if an assured demand arose, there would be little difficulty in finding local contractors willing to supply the oil in the Pyinmana and the Ruby Mines Division and from the Tenasserim Circle. The quotations of prices given by him are Rs. 60 per 100 viss, or about Rs. 20 per cwt. Gamble, quoting Lewin, gives Rs. 6-10 per maund (or Rs. 9-4-0 per cwt.), and states that 45,000 maunds (*i e*, 143 to 179 tons) are exported annually to Calcutta from Chittagong A home paper of July 1909 quotes Gurjan oil sold at 4½*d*. per lb

Enquiries.—Enquiries for Gurjan oil should be made of the Chief Conservator of Forests, Burma, Maymyo; of the Conservator of Forests, Eastern Circle, Eastern Bengal and Assam, Shillong, and of the Deputy Conservator of Forests, Andamans, Port Blair

"In" oil. "In" oil is obtained from *Dipterocarpus tuberculatus* in the same way as the Gurjan oil is obtained from *Dipterocarpus turbinatus*. It is used in preparing torches and for preserving bamboos. In comparison to Gurjan oil it is unimportant.

Thitsi oil. The most important of the oleo-resins is obtained from the Thitsi tree, *Melanorrhœa usitata*, a deciduous tree of Burma. The oleo-resin is a natural varnish, used for lacquer-work, caulking boats and in medicine. It is largely exported from the Burma forests, especially from the Tenasserim, Northern and Southern Circles. The right to collect Thitsi is farmed out annually

Outturn.—The outturn of Thitsi varnish is very considerable; thus, according to the Burma Administration Report for 1908-09, the approximate amount exploited was: 2 tons removed on payment of Rs. 108 from the Pegu Circle, 93 tons removed on payment of Rs. 3,241 from the Tenasserim Circle, 76 tons on payment of Rs. 4,581 from the Northern Circle, and 66 tons for Rs. 4,095 from the Southern Circle, or a total of 237 tons removed on payment of Rs. 13,025.

Enquiries.—Enquiries as to the sales of and the right to collect Thitsi varnish should be made of the Chief Conservator of Forests, Burma, Maymyo.

7. RUBBER.

Ficus elastica rubber.

The most important rubber-yielding tree found growing naturally in the State Forests is *Ficus elastica*, a very large tree of the outer Himalayas from Nepal eastwards, in Assam, the Khasia Hills and Upper Burma. It has also been cultivated in Assam in the Charduar plantation in the Tezpur Sub-Division, as also in the Kulsi plantation of the Gauhati Sub-Division in the Kamrup Division These plantations extend over 2,850 acres and 160 acres, respectively, and are both mature, tapping being carried out annually.

Other rubber-yielding plants.

There are a large number of other rubber-yielding trees found in the Indian and Burman forests, of which the following are the most important .—*Chonemorpha macrophylla*, *Cryptostegia grandiflora*, *Ecdysanthera micrantha*, *Rhynchodia Wallichii*, *Parameria glandulifera*, *Chavannesia esculenta* and *Willoughbeia edulis*. Rubber from these and other plants growing naturally in the forests can either be collected on terms quoted by Government or collected locally and offered for sale at Revenue Depôts, such as Myitkyna and Bhamo in Burma; Dibrugarh, Subansiri, Sibsagar, Dhansirimukh, Nowgong, Tezpur, Odalguri, Gauhati, Goalpara, Silchar, Jhalnachara, Tambulpur, Barpeta, Lakhipur, Shillong, Chuliakatta, North Lakimpur, Behali and Bengbari in Assam.

Para and other exotic rubber plants.

Attempts have been made to cultivate Para, Ceara and Castilloa in various parts of India and Burma, with success in the latter case; those, however, in India, though still in the experimental stage, are not altogether promising.

The largest plantations are those at Mergui in the Tenasserim Circle of Burma, where 1,500 acres have been successfully planted and are now yielding rubber, the species being almost entirely Para.

In India the chief attempts to cultivate these species have been made on the West Coast. In the Bombay Presidency about 180 acres were planted from 1908 onwards at Gairsoppa, and 16 acres at Kadra in North Kanara and 25 acres at Mulund in the Thana district. As regards the future success of these plantations opinions differ, and nothing but time can decide the matter. In Madras similar attempts have been made to cultivate rubber plants; for instance small plantations have been made at Tannirbhavi in South Kanara, at Kanoth in North Malabar, and at Arivallykava and Nelambur in South Malabar. Their present condition is similar to that of the Bombay plantations.

Outturn —The outturn of India rubber from *Ficus elastica*, during 1908-09, from State Forests of Eastern Bengal and Assam was 10,640 lbs., which sold at Rs. 78,520. In Burma, the Northern Circle yielded, 9,860 viss (or 35,989 lbs.), the right of collection being farmed out for Rs. 7,500, while in the Southern Circle, 200 viss (or 730 lbs) were collected on payment of Rs. 775.

From the Mergui Para plantations, in the Tenasserim Circle, 3,081 lbs. of dry rubber were obtained in 1908-09 and the greater portion exported to Europe for sale

The outturn of rubber from Government forests, both in Assam and Burma, is likely to increase considerably in the near future.

As regards prices of rubber, they fluctuate from month to month, so that no reliable figures can be stated, besides which the prices of various grades of rubber are so well known in commercial circles that it is not here necessary to give quotations.

Enquiries.—Enquiries as to the sale of rubber should be made of the Chief Conservator of Forests, Burma, Maymyo, and of the Conservators of Forests, Eastern and Western Circles, Eastern Bengal and Assam, Shillong.

8. DRUGS AND SPICES.

A variety of drugs and spices are obtained from State Forests which may be conveniently classified into (i) Root drugs, such as Podophyllum, Aconites, *Saussurea* spp., etc., (ii) Stem and Bark drugs, such as Cinnamon bark, Cassia bark, etc., and (iii) Fruit and Seed drugs, such as Nux-Vomica, Pepper, Cardamoms, Soap-nuts, etc. Some of these are exported to Europe while a great number are used in India only

(a) *Root Drugs*

Podophyllum. From the roots of *Podophyllum Emodi* is obtained a resinous substance known as Podophyllum. The plant puts out annual shoots, the roots and rhizomes being perennial. It occurs in the temperate Himalayas from Sikkim to Kashmir, being most common in the Punjab

Himalayas. For instance it is found on the Chor Hill near Simla, being more common on the Shalai Hill north-west of that place. It also occurs is Kulu, Hazara, Kurram Valley, on the Marale Hill and Jalauri Pass, and has been cultivated to a limited extent in these localities.

Outturn.—The possible outturn is fairly large. In former times the demand has been spasmodic, but recently enquiries for the rhizomes have been considerable and, with a prospect of a steady demand on a large scale, no doubt the question of extending its cultivation, which presents no difficulties, will engage the attention of the Department.

Watt gives the price as 7*s* 6*d* to 10*s*. per lb. In Bombay the price of the roots, before the resin is extracted, is about Rs. 16-12 to Rs. 21 per cwt.

Enquiries.—Enquiries as to the right to collect the roots should be made of the Conservator of Forests, Punjab, Lahore; of the Conservator of Forests, Western Circle, United Provinces, Naini Tal; and of the Conservator of Forests, Jammu and Kashmir State.

Saussurea Lappa. (the Khut plant)

The Khut, Kaur or Kùt plant occurs in Kashmir in the sub-Himalayan Chir forests and especially in the Kotli Tahsil. It is also found in the north of the Chamba and Hazara districts of the Punjab. The root bark is largely exported to the Punjab and is used in case of fever, boils, and to purify the blood. Mr. Lovegrove states that in Kashmir contracts are given for its extraction, the annual revenue at present being Rs. 2,81,000 and the amount allowed to be extracted being 16,944 kharwars = 1,344 tons approximately. He further states that before the Russo-Japanese war the price in Bombay was from Rs. 20 to Rs. 40 per maund of 80 lbs, it then dropped to Rs. 15, and has since recovered to Rs. 20 per maund.

Enquiries.—Enquiries for Khut should be made of the Conservator of Forests, Punjab, Lahore, and of the Conservator of Forests, Jammu and Kashmir State

Aconite spp.

A great variety of Aconites occur at higher altitudes in the Himalayas and are found from Afghanistan to Assam and on into Burma. They are not found in the Peninsula, being confined to the Himalayan region. Several of the species yield roots of commercial importance, amongst which may be mentioned *Aconitum ferox*, variety *spicatum*, known as the Nepal Aconite, found in Nepal and Sikkim, and exported from there to Calcutta.

Enquiries.—Enquiries regarding *Aconitum spicatum* should be made of the Conservator of Forests, Bengal, Darjeeling.

Other root drugs. A great variety of other root-drugs are obtained from the forests, amongst which may be mentioned *Rheum Emodi*, a wild rhubarb, found in the Nepal and Sikkim Terai; *Berberis aristata*, a shrub of the outer Himalayas, extending from the Sutlej to Bhutan, the roots of which yield a bright yellow extract, used in cases of opthalmia and bronchial troubles; *Jurinea macrocephala* or Himalayan Dhup-roots, burnt as incense, and extensively exported to the plains for this purpose; and *Ichnocarpus frutescens* roots, an evergreen climber found throughout India and Burma, used as a substitute for, and often mixed with, Sarsaparilla.

(*b*) *Stem and Bark Drugs.*

Cinchona spp., yielding the valuable drug quinine, cannot be classed as a forest product, as they are only exotics cultivated in India.

Cassia bark *Cinnamomum Tamala*, an evergreen tree of the Himalayas, found in shady valleys from Kumaun eastwards to Bhutan, Khasia Hills, but not abundant west of Kumaun, yields the Cassia bark of commerce. *Cinnamomum zeylanica*, a tree of the West Coast and Southern India, also yields Cassia bark. It occurs in fair abundance in the evergreen forests of North and South Kanara, Malabar, Tinnevelly and Travancore. Its collection is farmed out annually by the Department, thus in North Kanara the farm sold for Rs. 204 in 1908 09. A brown oil is also distilled from the leaves in South Kanara. The recent quotations for Cassia oil in the English market are 3*s*. 7*d* per lb. of 70%.

Enquiries.—Enquiries as to the sales of. or to the right to collect, Cassia bark should be made of the Conservator of Forests, Bengal, Darjeeling; the Conservators of Forests, Eastern and Western Circles, Eastern Bengal and Assam, Shillong; of the Conservator of Forests, Southern Circle, Bombay, Belgaum; and of the Conservator of Forests, Southern Circle, Madras, Coimbatore.

Other barks. A shrub or small tree, known as *Holarrhena antidysenterica*, found throughout India and Burma, yields a bark universally used by natives in cases of dysentery and fever. The bark of *Alstonia scholaris* is used as a tonic and in cases of diarrhœa, while many barks are used in native medicine, such as that of *Ailanthus excelsa*, *Michelia Champaca*, *Melia indica*, *Tinospora cordifolia*, *Ficus religiosa* and *Acacia leucophlœa.*

(*c*) *Fruit and Seed Drugs and Spices.*

Nux-Vomica seed. Many fruits and seeds provide valuable drugs and spices, amongst the most important of which is the seed of *Strychnos Nux-Vomica*, a large tree found in the Gorakhpur forests, in Bengal, Orissa, the Deccan, Nellore, Godavari and Ganjam districts of Madras, the Carnatic, and especially on the lower hills of Kanara, where it is very plentiful. It is also found all over Burma. The seed is collected by small contractors, who generally pay low rates for the right of collection, and who sell it to merchants for export.

Outturn and prices.—The possible outturn is very considerable from the West Coast and Burma forests, the conspicuous yellow brown berry being most noticeable when ripe. In Bengal it is sold annually for small amounts; in 1908-09, 143 cwts were exploited on payment of Rs. 90. In Madras, together with similar products, such as tamarind pods, gallnuts, sheakoy, etc., it realized Rs. 1,39,119 in the whole Presidency. In Bombay the right to collect the nut was farmed out for Rs. 165 in North Kanara.

Enquiries.—Enquiries as to the right to collect Nux-Vomica seed should be made of the Conservator of Forests, Eastern Circle. United Provinces, Naini Tal; Conservator of Forests, Bengal, Darjeeling; of either of the three Conservators of Madras; of the Conservator of Forests, Southern Circle, Bombay, Belgaum; and of the Chief Conservator of Forests, Burma, Maymyo.

Cardamoms.

Two varieties yielding cardamoms occur in forests, one the Malabar or the Lesser cardamom which is the true cardamom, of the West Coast and Burma, and the Greater cardamom or Nepal cardamom. It is with the former we are concerned, which is found in Kanara, the Wynaad in Malabar, and Madura district of Madras, and in the Tenasserim Circle of Burma, also in the States of Travancore and Coorg. It is extensively cultivated in the spice gardens of the abovementioned localities. The right to collect this product is farmed out in the various districts, as is the case with nearly all such minor products.

Outturn and prices.—Watt gives the exports in 1906-07 as 202,374 lbs., valued at Rs. 2,19,172; of this but a small quantity comes from the forests, the great bulk of the outturn being from cultivated lands. The Madras Forest Department sell the right to collect cardamoms together with similar products, the amount realized in 1908-09 being Rs. 9,110. In the West Salween Division of Tenasserim the right to collect the seed in the same year was sold for Rs. 4,975.

Enquiries.—Enquiries as to the right to collect the seed should be made of the Conservator of Forests, Tenasserim Circle, Burma, Rangoon, and of the Conservator of Forests, Southern Circle, Madras, Coimbatore.

Ritha or Soap-nut. The Ritha or Soap-nut is obtained from a large-tree, *Sapindus emarginatus*, found in the Deccan, Carnatic and evergreen forests of the West Coast, elsewhere cultivated. The nut is used as a substitute for soap and universally used for washing the hair by natives of India.

Outturn and prices.—The right to collect the seed is farmed out in Madras and Bombay. From the forests of Madras it was sold together with such seeds as Nux-Vomica, tamarind, and Ramphul, etc, in 1908-09, for Rs. 1,39,119 and from the South Division of Kanara in Bombay for Rs. 1,090.

Enquiries—Enquiries for the right to collect the Soap-nut should be made of the Conservator of Forests, Southern Circle, Madras, Coimbatore, and of the Conservator of Forests, Southern Circle, Bombay Presidency, Belgaum.

Pepper. Various species of pepper are found in Indian forests, a common variety being the long pepper, *Piper longum*, found in the damp evergreen forests of Bengal, Assam, and West Coast.

Outturn and prices.—The possible outturn is fairly large. Pepper is either gathered free or the right to collect it farmed out to contractors. In 1908-09, the amount collected in Bengal, according to the Forest Administration Report, was 800 lbs, on payment of Rs. 195; in Eastern Bengal and Assam leases were given for Rs. 755 and Rs. 1,055 and a small amount sold to purchasers and valued at Rs. 115; in Madras it was sold together with dammars, turmeric and cardamoms for a total of Rs. 9,110; in Bombay the sales were trifling.

Enquiries.—Enquiries for pepper and the right to collect the same should be made of the Conservator of Forests, Bengal, Darjeeling; of the Conservators of Forests, Eastern and Western Circles, Eastern Bengal and Assam, Shillong; and of the Conservator of Forests, Southern Circle, Madras, Coimbatore.

Shigakai or Sheakoy. The pods of *Acacia concinna*, a scandent shrub found in most parts of India and Burma, and known as Shigakai or Sheakoy, are used as a substitute for soap and extensively collected for this purpose from many localities. Thus the right to collect the pods was sold during 1908-09, in Madras, together with that of tamarind pods, soap-nuts and Nux-Vomica seeds for Rs. 1,39,119. In the same year the pods fetched in the Southern Circle Rs. 626, and in the Northern Circle of Bombay Rs. 599.

Bael fruit. The well known fruit of the "Bael" tree *Ægre Marmelos*, found in most of the drier forest localities of India and Burma, is used in cases of dysentery, often with very satisfactory results. No records are available as to the sale of this fruit, it generally being collected free by privilege and right-holders.

Cassia Fistula pods. The pulp of the fruit of *Cassia Fistula*, the Indian Laburnum, yields a most effective purgative and is very commonly used for this purpose in India. In the Garhwal Division of the United Provinces about 37 tons are exported annually for the Delhi, Agra and Bareilly markets, where it sells for Rs. 3-6 to Rs. 4-12 per cwt

Other drugs. Of the many other drugs may be mentioned the "Marking-nut tree" *Semecarpus Anacardium*, the pericarp of which yields a corrosive juice used for marking-ink; *Cæsalpinia Bonducella*, a climbing shrub yields the fever-nut, extensively used in India in cases of intermittent fever; *Myristica malabarica* yields a yellow mace, which covers the nut, known as "rampatri" and the nut as "ramphal." The right to collect ramphal-rampatri is farmed out annually in North Kanara and realized Rs. 220 in 1908-09; its collection is also farmed out annually in the South Kanara and Malabar districts.

Curcuma aromatica, known on the West Coast as "Ambe-halad," is a wild turmeric used as substitute for the true turmeric. The right to collect the roots is farmed out annually in the Western Division, Kanara, as also elsewhere.

9. EDIBLE PRODUCTS

Edible fruits, leaves and roots The number of edible fruits, leaves and roots found in forests is very large, though the revenue derived by the State from the same is comparatively small, as in most localities the people living in the neighbourhood of the forests have the right or privilege to collect them free. In certain localities, however, the collection is farmed out to contractors, as for instance, in Sind and the Central Circle of Bombay, where the mango crop is sold annually from limited areas. Some of the most important fruit-bearing trees found in forests, and which are now also largely cultivated, are the Jack tree, *Artocarpus integrifolia*, indigenous on the Ghats of the West Coast, and *Artocarpus Lakoocha*, both cultivated; the mango, *Mangifera indica*, found in the tropical forests of India and Burma, extensively cultivated; *Eugenia Jambolana*, found throughout India; the walnut tree, *Juglans regia*, found in the Himalayas and Northern Burma; *Mimusops Elengi*, a tree of Southern and Central India; *Spondias mangifera*, the hog-plum; *Zizyphus Jujuba*, the Bhor fruit; Mangosteen, considered one of the most delicate fruits of the East, and obtained from a tree known as *Garcinia Mangostana*; *Moringa pterygosperma*, the drum-stick tree, the fruit of which is made into curry; *Prosopis spicigera* pods; many of the *Prunus* spp found in the Western Himalayas, such as *Prunus armenica*, the apricot tree, *Prunus Padus*, the wild cherry, and *Prunus eburnea* of Baluchistan, yield excellent fruit; in the same way *Pyrus* spp., *Rubus* spp., *Ficus* spp, etc., all bear edible fruits.

Edible Grass-seeds Grass-seeds are often collected by wild tribes and ground into flour, of which they prepare coarse bread. Bamboo seed is, and probably always will be, a common source of food, especially in times of famine.

10. BAMBOOS AND CANES.

(a) *Bamboos.*

The number of different species of bamboos found in India and Burma is very large, numbering in all about 100, of which some are restricted in their distribution, while others cover vast areas. Their commercial and economic value varies not only with the species but also with the locality.

Dendrocalamus strictus. The most valuable and universally used species is *Dendrocalamus strictus*, a comparatively small, either solid or hollow bamboo, which is found all over India and Burma in moderately moist forests, but not in Eastern Bengal and Assam. Though exploited from nearly all forests in which it is found it is most extensively worked and the highest prices are obtained for it in the Ganges Division of the United Provinces, where the average annual outturn for the last 10 years was 9,695,447 bamboos, sold standing in the forest for Rs. 1,05,803.

Other varieties of Bamboos. Of other very common species found in the forests of India and Burma may be mentioned *Bambusa arundinacea*, a large bamboo growing in favourable places from 80 to 100 feet in height and 6″ to 10″ diameter; *Bambusa Tulda*, *Bambusa polymorpha* and *Cephalostachyum pergracile*, common bamboos of Eastern Bengal and Assam and Burma; and *Melocanna bambusoides* found in the Garo and Khasia Hills, Chittagong and Arakan Hill Tracts, and Tenasserim in Burma

Bamboos of different kinds are used for a variety of purposes, such as for superstructure, roofing, walling, flooring, matting, spear-shafts, masts, spars, buggy-shafts, bamboo furniture, tent-poles, walking-sticks, water pipes, transport poles, basket-making, musical instruments, such as flutes, and though not at present used for paper-pulp in India, it is very probable that they may be used for this purpose in the near future.

Outturn and prices—The prices at which bamboos sell in the market vary according to species, and with the demand as compared with the supply, and the distance from the forest to the centre of consumption. As before stated, the highest prices are probably obtained in the Ganges Division, where the royalty is 1 anna each for bamboos over 20 feet in length, while in the market at Najibabad they fetch as much as 12 annas to Re. 1 per bamboo of 16 to 20 feet in length (Rebsch). In other localities the royalty varies greatly, the rates fixed for bamboos taken out for sale or barter differing from those for bamboos taken out for private purposes, while enormous quantities are taken out free.

As illustrating the number of bamboos taken out on payment of fees or given free, the following figures have been taken from the various Administration Reports for 1908-09 :—

Locality.	Approximate number taken out on payment or free.	Approximate Value.
		Rs.
Bengal	11,178,555	46,835
United Provinces	11,669,457	1,28,129
Central Provinces	13,633,274	1,58,809
Eastern Bengal and Assam	48,236,778	74,060
Punjab	315,312	9,902
Burma	67,293,000	2,30,256
Andamans	1,026,817	645
Madras	32,001,730	Not given.
Bombay	33,479,042	Ditto

Enquiries.—Enquiries as to obtaining permits or leave to exploit bamboos should be made of any of the District Forest Officers or Conservators.

(*b*) *Canes.*

A great variety of canes occur in the forests of India and Burma, especially in Bengal, Eastern Bengal and Assam, Burma, the Andamans and on the West Coast. They are either used locally or exported for such purposes as for basket-making, furniture, cordage, walking-sticks, fishing-rods, as a substitute for punkha ropes, etc. The following data are given as to the localities whence canes are available, as furnished by various District Forest Officers, it being impossible, for want of space, to give information for more than a few species which occur in fair abundance in Bengal, Eastern Bengal and Assam, Burma and the Andamans. By restricting the areas dealt with to the above mentioned provinces it is not intended to convey the idea that canes do not occur elsewhere but that the most important areas only are dealt with.

Locality.	Scientific and Vernacular name.	Approximate amount available	Approximate value (exclusive of royalty)
BENGAL.			
Tista Division	*Calamus acanthospathus* (Gauri Bet)	It is not uncommon in the more remote areas, while forests near Darjeeling have been heavily worked.	Market rate 8 annas a coolie load. Cost of landing on a station 8 annas per maund of 80 lbs., exclusive of royalty
Ditto	*Calamus latifolius* (Puth or Ruchhi.)	11 to 14 tons annually	11 to 13 annas per cwt on station
Puri Division	*Calamus viminalis* (Kâtho Bet)	36 tons annually	At Balugaon station, Bengal-Nagpur Railway, Rs 1-9 per cwt.
EASTERN BENGAL AND ASSAM.			
Jalpaiguri Division	*Dæmonorops Jenkinsianus* (Garra, Garal, or Dudi.)	300 coolie-loads	10 annas per coolie-load (about 60 lbs.)
Lakhimpur Division	*Calamus tenuis* (Jali)	About 1,895,760 bundles pass the Revenue stations yearly, and 2,000,000 bundles are given as the possible out-turn.	Canes can be landed at the nearest steamer ghat at Rs 3-8 to Rs 4-8 per 100 bundles.
BURMA.			
Mu Division	*Calamus erectus* (Thaing)	Large quantities obtainable	Could be taken to Bassein at no great expense
Rangoon Division	*Calamus* spp (Kyinga.)	3,000 canes annually.	Canes of 6 feet length could be put on rail at Re. 1-8 per 100
Ruby Mines Division	*Calamus Guruba* (Kyein -ni)	10,000 canes annually The number of canes of all sorts exported from the Ruby Mines Division in 1902-03 was 268,000	The price landed in Mandalay is given as Rs 24-8 per 1,000 canes
Thaungyin Division	*Calamus latifolius* (Yamata.)	80,000 canes annually.	Rs 4 per cane of 175 feet in length in Moulmein.
Ditto	*Calamus Guruba* (Kyeing-ni.)	16,000 canes annually.	Ditto.
Ditto	*Calamus viminalis* (Kyet-u.)	20,000 canes annually.	Rs. 3 per cane of 160 feet in length in Moulmein.

Locality.	Scientific and Vernacular name.	Approximate amount available.	Approximate value, (exclusive of royalty.)
BURMA—contd.			
South Tenasserim Division.	*Calamus* spp (Kyein-byu.)	Plentiful	Rs. 9 per 1,000 in market at Mergui.
Tavoy District .	*Calamus viminalis* (Kyeinkha or Kyet-u)	Do .	Rs 3-12 per 1 000 to bring them to Tavoy. Rate in local market Rs 15 per 1,000.
Tavoy District .	*Calamus latifolius* (Yamata)	Do. .	Rs 3-12 per 1,000 to bring them to Tavoy Rate in Local market Rs 15 per 1,000
Ditto .	*Calamus Guruba* (Kyeing-ni)	Do	Ditto.
Myithyina Division	*Calamus viminalis*, (Kyein-ga or Kha or Kyet-u)	Fairly common	Not known.
Katha Division	*Calamus Guruba* (Kyeing-ni)	Fairly abundant .	Rs 1-8 to Rs. 2 per 100 on rail
Lower Chindwin Division	*Calamus viminalis* (Kyet-u)	1,000 canes, 12 feet long, annually or more.	Rs 12 per 1,000 on rail
Ditto	*Calamu latifolius* (Yamata)	Ditto	Rs. 17-8 per 1,000 on rail
Bhamo Division	*Calamus grandis* (Ye-Kyein)	Large numbers available.	Rs 4-8 per 100 viss. (1 viss = 3¼ lbs)
Ditto .	*Calamus Guruba*	Ditto	Ditto.
ANDAMANS	1 *Calamus latifolius* 2 ,, *andamanicus* 3 ,, *tigrinus* 4 ,, *grandis* 5 ,, *fasciculatus* 6 ,, *Helferianus*	Not known but probably fairly plentiful.	Royalty 2 annas per 100 for rattan roots, 1 anna per 100 without roots Export duty Rs 1-4 per maund of 80 lbs

Enquiries.—Enquiries for canes should be directed to the Chief Conservator of Forests, Burma, Maymyo ; the Conservator of Forests, Bengal, Darjeeling ; the Conservators of Forests, Eastern and Western Circles, Eastern Bengal and Assam. Shillong ; the Deputy Conservator of Forests, Andamans, Port Blair ; the Conservators of Forests, Eastern and Western Circles, United Provinces, Naini Tal ; the Conservator of Forests, Southern Circle, Bombay. Belgaum ; and to the Conservator of Forests, Southern Circle, Madras, Coimbatore

11. ANIMAL PRODUCTS

There are one or two animal products obtained from the forest of considerable value, not only from a revenue point of view but also as being most necessary to certain industries. Of these the most important is, without question, lac. The collection of honey and wax is also worthy of notice, while elephant-catching is an important business in Burma, Eastern Bengal and Assam, and in Malabar.

(a) *Lac*

Much literature is available as to the cultivation and propagation of lac, its uses and market value; it will here only be necessary to indicate the chief localities in which it is found. For further reference on the subject such treatises as Stebbing's Monograph on the Lac Insect, Indian Forest Memoirs, Vol. I, Part III, Zoology Series; Watt's Agricultural Ledger, No. 9, Entomological Series, No. 9 of 1901; Puran Singh's Note on the Manufacture of Pure Shellac, Indian Forest Memoirs, Vol. I, Part II, Chemistry Series; and A. E. Lowrie's "Propagation and Collection of Lac," may be consulted.

The chief lac-producing forest areas are the Central Provinces, Burma and Sind, though lac is also cultivated in fair quantities in East Assam and Bengal and to a less extent in the Punjab, United Provinces and Madras.

Central Provinces.—The most important lac-producing areas in the Southern Circle of the Central Provinces are North Chanda, Balaghat, Raipur, and to a less extent the Bhandara Divisions, while some of the Zamindari forests produce far larger quantities than the Government Reserves. In the Northern Circle nearly all the divisions produce lac, the Damoh, Mandla, Seoni and Saugor Divisions being the most important; Ellichpur in the Berars is also an important Division in this respect.

Bengal.—The forests of Bengal do not produce much lac at present, the lac areas being confined to the Singhbhum and Palamau Divisions of Chota Nagpur and the Sonthal Parganas.

Sind.—The Sind babul forests yield large quantities of lac, and are, together with the Central Provinces area, the largest lac-producing localities in India, the Hyderabad Division of Sind being most important in this respect.

Eastern Bengal and Assam.—In Eastern Bengal and Assam lac is found in the Garo Hills, Khasia Hills, Nowgong and the Kamrup Divisions, the area from which lac is collected being "unclassed forests."

Burma.—The unclassed forests of the Southern Circle of Burma turn out a considerable amount of lac annually.

Outturn and prices.—As illustrating the outturn from, and prices realized in, the chief lac-producing forest areas, the following figures have been taken from the Administration Reports of 1908-09 :—

Locality.	Approximate outturn.	Approximate value.	REMARKS.
Central Provinces	6,642 lbs. collected departmentally. The amount extracted on lease is not known.	Rs. 36,147 including leases.	..
Burma	1,438 tons	Rs. 68,212	Nearly all from the Unclassed forests of the Southern Circle.
Bombay and Sind	Not given	Rs. 28,463	All from the Hyderabad Division of Sind.
Bengal	Not known correctly.	Rs. 1,301	Removed by purchasers.
Eastern Bengal and Assam.	809 tons	Rs. 28,382	From Unclassed forests.

The lac revenue for this year, 1908-09, is extremely low, except in Burma, where the export duty, recently enforced, considerably increased the amount realized under this head. In Sind, the amount of Rs. 28,463 realized in 1908-09 is exceptionally low, owing to the slump in the lac-market, as in 1907-08, Rs. 83,675 only were realized for lac, the figure in good years being generally over one lakh of rupees.

The market prices for lac fluctuate considerably from year to year ; at present the average for "Kosum" lac may be put at Rs. 28 per maund.

The amount of lac exported from India in 1907-08, according to the Inspector General of Forests' Report, was as follows :—

Button lac	1,976 tons	Value Rs.	46,80,489.
Shellac	13,917 ,,	,, ,,	3,32,38,167.
Stick, Seed and other kinds	2,245 ,,	,, ,,	29,11,935.

Enquiries.—Enquiries as to leases for collecting lac should be addressed to the Chief Conservators of Forests, Central Provinces, Nagpur, and Burma, Maymyo ; to the Conservators of Forests, Eastern and Western Circles, Eastern Bengal and Assam, Shillong ; the Conservator of Forests, Bengal, Darjeeling ; and the Deputy Conservator of Forests, in charge Hyderabad, Sind.

(b) *Wax and Honey.*

Wild honey and wax are obtainable from many forests of India and Burma and are produced chiefly by the common wild bees, *Apis dorsata* and *Apis indica.* They are collected either free by forest villagers and wild tribes, as is the case in the Khandesh Satpuras and elsewhere, or the right of collection is leased on contract, as is the case in parts of Bengal.

Outturn and prices—As illustrating the approximate outturn of wax and honey from various localities, the following figures have been taken from Forest Administration Reports for 1908-09 :—

Locality.	Approximate quantity.	Apprioxmate value of leases.
		Rs.
Bengal	Wax and honey, 341 tons.	16,827
Eastern Bengal and Assam . . .	Wax only 118 cwts.	647
Madras	Honey, wax, etc.,—amount not given.	12,828
Bombay, Southern Circle	Amount not given.	2,072

Enquiries—Enquiries should be addressed to the Conservator of Forests, Bengal, Darjeeling, the Conservators of Forests, Eastern and Western Circles, Eastern Bengal and Assam, Shillong, the Conservator of Forests, Madras; and the Conservator of Forests, Southern Circle, Bombay Presidency, Belgaum, as to the time for submitting tenders for the right to collect wax and honey.

(c) *Other Animal Products*

Various other animal products are sold annually in different provinces; for instance, 1,045,961 silk cocoons were sold in Bengal in 1908-09; Rs. 3,040 worth of ivory in Eastern Bengal and Assam; in the same province leases to catch elephants were given out for Rs. 32,341, and the number captured was 364 valued at Rs. 36,400. Horns and skins are sold in nearly all provinces, a small revenue only being derived under this head.

12. Miscellaneous Minor Forest Products.

A very large number of miscellaneous products are sold annually from the forests; it is only here possible to name a few of them, so as to indicate the possible outturn and their relative local value.

Pathi Leaves.

In Eastern Bengal and Assam the palm leaves of *Licuala peltata* in Sylhet and of *Livistona Jenkinsiana* in Lakhimpur are used for thatching, making torches and umbrellas. They are exploited either by purchasers or to a large extent given free; thus in 1908-09, 135,000 leaves were sold for Rs. 86 and 5,504,120 were given away free valued at Rs. 3,439.

Talipot Palms.

In the Honawar Range of the Southern Division of North Kanara, the Talipot palm, *Corypha umbraculifera*, occurs in great abundance and numbers are sold annually for the flour or sago obtained from the stem and for the leaves used in making umbrellas and fans; thus in 1907-08 such palms were sold for Rs. 3,409

Cigarette Leaves.

There is an ever-increasing demand for cigarette leaves in certain localities, so much so that in 1908-09 the sales of Tendu or Tembru, *Diospyros Melonoxylon*, and Apta, *Bauhinia racemosa*, leaves amounted to Rs. 11,178 in the Northern Circle of Bombay.

Mineral Products.

Mineral products are worked out in some forests, such as mica in Bengal, the royalty on which realized Rs. 24,721 in 1908-09 Manganese has been worked in Bombay, especially in the Panch Mahals; while in most districts fees are levied for quarrying stones, the amounts so realized, however, being small.

Other Minor Products.

Many other minor products of small value to meet purely local demand are exploited from forests all over India and Burma, which for want of space have not been mentioned in this treatise

Enquiries.—If interested persons require information on any forest products, they should address the local Forest Officers, or if the address of the Forest Officer is not known, a reference should be made to the office of the Imperial Forest Economist, Dehra Dun, United Provinces, who will be pleased to supply all available information.

INDEX TO SCIENTIFIC NAMES.

A

PAGE.

Abies Pindrow, *Spach*. . 9
„ Webbiana, *Lindl*. . 9
Acacia spp. . 135
„ arabica, *Willd*. 11, 129, 134
„ Catechu, *Willd*. 12, 123
„ concinna, *DC*. 146
„ leucophlœa, *Willd*. 115, 132, 144
„ Senegal, *Willd*. 136
„ Suma, *Buch* . 132
Aconitum ferox, *Wall*. . 143
„ spicatum, *Stap. f*. 143
Adina cordifolia, *Hook. f*. 13
Æchmanthera Wallichii, *Nees* . . . 117
Ægle Marmelos, *Correa* . 146
Agave spp *Linn*. . 112
„ americana, *Linn* . 112
„ lurida . . . 112
„ rigida . 112
„ vivipara, *Linn* 112
Ailanthus excelsa, *Roxb* 144
Albizzia Lebbek, *Benth* . 14
„ odoratissima, *Benth*. 16, 116
Alnus nepalensis, *Don*. . 135
„ nitida, *Endl* 135
Alstonia scholaris, *R Br*. 144
Anacardium occidentale, *Linn* . . 128
Andropogon contortus, *Linn*. . . 118
Anodendron paniculatum, *A. DC*. . 116
Anogeissus latifolia, *Wall*. . . 16, 132, 137
Antiaris toxicaria, *Lesch* 115
Apis dorsata, *Fabr*. . 153
„ indica, *Fabr*. .
Aquilaria Agallocha, *Roxb* 122
Artocarpus Chaplasha, *Roxb* 21
„ integrifolia, *Linn f*. 22, 134, 147
„ Lakoocha, *Roxb*. 23, 134, 147
Asclepiadaceæ . 116
Avicennia officinalis, *Linn*. . 132

B

Bambusa arundinacea, *Willd*. . 18
„ polymorpha, *Munro* . 148
„ Tulda, *Roxb*. . 148
Barringtonia acutangula, *Gærtn*. . . 23
Bassia butyracea, *Roxb*. . 126
„ latifolia, *Roxb*. . 24, 124, 125
Bauhinia purpurea, *Linn*. 132
„ racemosa, *Lam*. 115, 155
„ Vahlii, *W. & A*. 115
Beaumontia grandiflora, *Wall*. 117

PAGE.

Berberis aristata, *DC*. . 135, 144
„ nepalensis, *Spr*. 135
Berrya Ammonilla, *Roxb*. 116
Bischofia javanica, *Blume*. 25
Bixa Orellana, *Linn*. 135
Blumea balsamifera, *DC*. 124
Bœhmeria macrophylla, *Don*. . 115
„ malabarica, *Wedd*. 115
„ nivea, *Hook and Arn*. 115
„ platyphylla, *Don*. 115
„ rugulosa, *Wedd* . 26
Bombax insigne, *Wall*. 27
„ malabaricum, *DC* 28, 115, 117, 128
Borassus flabellifer, *Linn*. 113
Boswellia serrata, *Roxb*. 29, 138
Broussonetia papyrifera, *Vent*. . 116
Buchanania latifolia, *Roxb* . 128, 138
Butea frondosa, *Roxb* 30, 115, 135, 137

C

Cæsalpinia Bonducella, *Roxb* 147
„ coriaria, *Willd*. . 134
„ sepiaria, *Roxb* 132
Calamus spp . 150, 151
„ acanthospathus, *Griff* 150
„ andamanicus, *Kurz* 151
„ erectus, *Roxb*. . 150
„ fasciculatus, *Roxb*. . 151
„ grandis, *Kurz* 151
„ Guruba, *Ham* 150, 151
„ Helferianus, *Kurz* . 151
„ latifolius, *Roxb*. 150, 151
„ tenuis, *Roxb* . 150
„ tigrinus, *Kurz* . 151
„ viminalis, *Willd*. 150, 151
Calophyllum Inophyllum, *Linn* 31, 128, 138
„ tomentosum, *Wight* . 31
Calotropis spp . . 116
„ gigantea, *R. Br*. . 116, 117
„ procera, *R Br*. . . 116, 117
Calycopteris floribunda, *Lamk* 115
Canarium reziniferum, *Broce* . . . 136
Canarium strictum, *Roxb*. 136
Cannabis sativa, *Linn* . 115
Carallia integerrima, *DC* 32
Careya arborea, *Roxb*. 34, 116
Caryota urens, *Linn*. . . 112

PAGE.

Cassia auriculata, *Linn*. 131
„ Fistula, *Linn*. 34, 131, 147
Castanopsis Hystrix, *A. DC*. . 35
Casuarina equisetifolia, *Forst* . 36, 132
Cedrela Toona, *Roxb* 37, 136
Cedrus Libani, *Barrel*, var Deodara, *Loudon* 38, 122
Celastrus paniculata, *Willd*.. . . 127
Cephalostachyum pergracile, *Munro* . 148
Cerbera Odollam, *Gærtn*. 116
Ceriops Candolleana, *Arnott* . 132
„ Roxburghiana, *Arnott*. . 132
Chavannesia esculenta, *A DC* . . 141
Chloroxylon Swietenia, *DC* . . 41
Chonemorpha macrophylla, *G Don* . 141
Cinchona spp, *Linn*. 144
Cinnamomum Camphora, *Nees and Eberm* 124
Cinnamomum Tamala, *Nees* 124, 144
„ zeylanicum, *Breyn* 124, 144
Cochlospermum Gossypium, *DC*. 117, 137
Corchorus capsularis, *Linn*. 115
„ olitorius, *Linn* 115
Cordia Myxa, *Linn* . 116
„ Rothii, *Röm. and Sch* . . 116
Corypha umbraculifera, *Linn* . . 155
Cryptolepis Buchanani, *Röm and Sch*. . 116
Cryptostegia grandiflora, *Br*. . . 141
Cupressus torulosa, *Don*. 42
Curcuma aromatica, *Salisb*. . 147
Cymbopogon citratus, *DC*. 120, 121
„ flexuosus, *Stap f*. 121
„ Martini, *Stap. f*. 120
Cyperus tegetum, *Roxb*. . 120

D

Dæmonorops Jenkinsianus, *Mart*. . . 150
Dalbergia latifolia, *Roxb*. 43
„ Sissoo, *Roxb*. 45, 115
Dendrocalamus strictus, *Nees*. 148
Diospyros Ebenum, *Kœnig*. 46
„ Kurzii, *Hiern*.. 47
„ Melanoxylon, *Roxb*. 47
„ montana, *Roxb* 128
„ tomentosa, *Roxb*. . 47

PAGE.

Dipterocarpus spp. . . 140
„ tuberculatus, *Roxb*. 48, 140
„ turbinatus, *Gærtn. f*. 49, 140
Dregea volubilis, *Benth*. . 116

E

Ecdysanthera micrantha, *A. DC*. . . . 141
Erythrina suberosa, *Roxb* 50, 116
Eugenia Jambolana, *Lam* 50, 132, 147

F

Ficus spp. . . . 148
„ bengalensis, *Lin*. 51, 115
„ Cunia, *Ham*. . . 111
„ elastica, *Roxb* . 141
„ religiosa, *Linn* 115, 144

G

Garcinia Mangostana, *Linn* 148
Gardenia gummifera, *Linn f*. 138
„ lucida, *Roxb*. . 138
Garuga pinnata, *Roxb* . 132
Gmelina arborea, *Roxb*. . 52
Grewia spp . . 115
„ lævigata, *Vahl*. . 115
„ oppositifolia, *Roxb*. . . 115
„ scabrophylla, *Roxb* . . 115
„ tiliæfolia, *Vahl*. 53, 115
„ vestita, *Wall*. . 115

H

Hardwickia binata, *Roxb*. 54, 114
Helicteres Isora, *Linn*. . 114
Heritiera minor, *Roxb*. . 56
Holarrhena antidysenterica, *Wall*. . 57, 117, 144
Holoptelea integrifolia, *Planch*. . . . 57
Homalium tomentosum, *Bth*. . . . 58
Hopea odorata, *Roxb*. 59, 138, 139
„ parviflora, *Bedd*. . 60

I

Ichnocarpus frutescens, *R. Br*. 144
Imperata arundinacea, *Cyrill* 118
Ischæmum angustifolium, *Hack*. . . . 117

PAGE.

J

Jatropha Curcas, *Linn.* . 128
Juglans regia, *Linn.* . 61, 128, 147
Jurinea macrocephala, *Benth.* . . . 144

K

Kydia calycina, *Roxb.* . 116

L

Lagerstromia Flos-Reginæ, *Retz.* 62
" lanceolata, *Wall.* 64
" parviflora, *Roxb.* 65, 132
Lawsonia alba, *Lam.* . 132
Leguminosæ . . . 114
Licuala peltata, *Roxb* . 155
Livistona Jenkinsiana, *Griff* 155

M

Mallotus philippinensis, *Muell. Arg.* . . 135
Mangifera indica, *Linn.* 66, 147
Marsdenia tenacissima, *Wt. and Arn.* . . 116
Melanorrhœa usitata, *Wall.* . . 140
Melia indica, *Brandis* 67, 128, 144
Melocanna bambusoides, *Trin.* . . . 148
Mesua ferrea, *Linn.* . 68, 127
Michelia Champaca, *Linn.* 135, 144
Millettia auriculata, *Baker* 115
Miliusa velutina, *Hook. f. and Th.* . . 116
Mimusops Elengi, *Linn.* . 69, 128, 147
" littoralis, *Kurz* 135
Morinda tinctoria, *Roxb.* . 135
Moringa pterygosperma, *Gaertn.* . 116, 137, 148
Musa paradisiaca, *Linn.* . 113
" sapientum, *Linn.* . 113
" superba, *Roxb.* . 113
Myristica malabarica, *Lamk.* 147

PAGE.

N

Nerium odorum, *Solander* 117
Nipa fruticans, *Wurmb* . 113
Nyctanthes Arbor tristis, *Linn.* 135

O

Ochrocarpus longifolius, *Bth. and Hk. f.* . 135
Odina Wodier, *Roxb.* . 70, 116, 132, 137
Oleum Nigrum 127
Orthanthera viminea, *W. and A.* . . 116
Ougeinia dalbergioides, *Benth.* . 71, 115

P

Pandanus spp. . . 111
" odoratissimus, *Linn. f* . 111
Parameria glandulifera, *Benth.* . 141
Phœnix sylvestris, *Roxb.* 113
Phragmites spp. . 120
Phyllanthus Emblica, *Linn.* . 132, 134
Picea Morinda, *Link.* . 74
Pinus excelsa, *Wall.* 75, 136, 139
" Khasya, *Royle* . 136, 139
" longifolia *Roxb.* . 77, 136, 139
Piper longum, *Linn.* . 146
Podocarpus neriifolia, *Don.* . . 79
Podophyllum Emodi, *Wall* . . . 142
Pongamia glabra, *Vent.* . 127
Populus ciliata, *Wall.* . 117
" euphratica, *Olivier.* . 80
Prinsepia utilis, *Royle.* . 128
Prosopis spicigera, *Linn.* 148
Prunus spp. . 148
" armeniaca, *Linn.* 148
" eburnea, *Aitch et Hemsl.* . 128, 148
Prunus Padus, *Linn.* . 148
Petrocarpus dalbergioides, *Roxb.* . 81
" macrocarpus, *Kurz.* . 82
" Marsupium, *Roxb.* 84, 137
" santalinus, *Linn. f.* 86, 134

PAGE.

Punica Granatum, *Linn.* . 135
Pyrus spp. . . . 148

Q

Quercus dilatata, *Lindl.* . 87
" incana, *Roxb.* . 88

R

Rheum Emodi, *Wall.* . 144
Rhizophora spp. . . 132
" mucronata, *Lamk.* 129, 132
Rhus mysorensis, *Heyne* 132
Rhynchodia Wallichii, *Benth.* . . . 141
Rubus spp. . . . 148

S

Saccharum arundinaceum, *Retz.* . 117
" Narenga, *Ham.* . 118
" procerum *Roxb* 118
Salix daphnoides, *Vill* 117
Santalum album, *Linn* . 89
Sapium sebiferum, *Roxb.* 128
Sapindus emarginatus, *Vahl.* . . . 146
Saussurea spp . 143
" Lappa, *Clarke* . 143
Schleichera trijuga, *Willd* 92, 126
Semecarpus Anacardium, *Linn. f.* 128, 147
Shorea robusta, *Gaertn f.* 93, 128, 132, 136
Smilax prolifera, *Roxb.* . 116
Soymida febrifuga, *Adr. Juss.* . 97, 138
Spatholobus Roxburghii, *Bth* 115
Spondias mangifera, *Pers.* 147
Stephegyne parvifolia. *Korth* . . . 98
Sterculiaceæ . . 114
Sterculia colorata, *Roxb.* 114
" fœtida, *Linn.* . 114
" urens, *Roxb* . 114
" villosa, *Roxb.* . 114
Strychnos Nux-Vomica, *Linn.* . . . 144
Symplocos spp . . 135

PAGE.

T

Tamarix articulata, *Vahl.* 132
Taxus baccata, *Linn.* . 99
Tectona grandis, *Linn f.* . 100
Terminalia belerica, *Roxb.* 134
" Chebula, *Retz.* 133
" paniculata, *W. and A* 103
" tomentosa, *W. & A.* 104, 132, 135
Thespesia populnea, *Corr.* 116
Tiliaceæ . . 115
Tinospora cordifolia, *Miers.* . . 144
Trema orientalis, *Blume.* . 115

U

Urticaceæ . . 115

V

Vateria indica, *Linn.* 107, 128, 130 138
Ventilago madraspatana, *Gaertn.* . 131, 135
Vetiveria zizanioides, *Stapf.* 120

W

Willorghbeia edulis, *Roxb.* 111
Wrightia tomentosa, *Rom and Sch.* . . . 117

X

Xylia dolabriformis, *Benth.* 107

Z

Zizyphus Jujuba, *Lam.* 147
" xylopyra, *Willd.* 134

INDEX TO ENGLISH AND VERNACULAR NAMES.

A

		Page.
Aali, Tam.	Holoptelia integrifolia, *Planch.*	57
Abnús, Hind.	Diospyros Ebenum, *Kœnig.* „ Melanoxylon, *Roxb.*	46 47
Acha, Kan., Tam.	Hardwickia binata, *Roxb*	54, 114
Acha, Tam.	Diospyros Ebenum, *Kœnig.*	46
Aconite, Nepal	Aconitum ferox, *Wall.* var. spicata *Stap. f.*	143
Adappu, Tam.	Barringtonia acutangula, *Gærtn.*	23
Admpu, Tam.		
Adhuari, Hind.	Lagerstromia parviflora, *Roxb.*	65, 132
Agar attar		122
„ *oil*	...	122
„ *tree.*	Aquilaria Agallocha, *Roxb.*	122
Agil, Tam.	Hopea parviflora, *Bedd.*	60
Ahlada, Kan.	Ficus bengalensis, *Linn.*	51, 115
Ahnau, Kan.	Adina cordifolia, *Hook. f.*	13
Ain	Terminalia tomentosa	104
Ajhar, Ass.	Lagerstromia Flos-Reginæ, *Retz.*	62
Akhrot, Hind.	Juglans regia, *Linn.*	61, 128, 147
Akota, Kan.	Schleichera trijuga, *Willd.*	92, 126
Akrut, Beng.	Juglans regia, *Linn.*	61, 128, 147
Al, Kan	Ficus bengalensis, *Linn.*	51, 115
Ala, Kan., Tam.		
Alada, Kan		
Aladamara, Kan.		
Alau, Tam.		
Alasu, Kan.	Artocarpus integrifolia, *Linn. f.*	22, 147
Alti, Tam.	Hardwickia binata, *Roxb*	54, 114
Aluppe, Kan.	Bassia latifolia, *Roxb.*	24, 124, 125
Am, Hind.	Mangifera indica, *Linn*	66, 147
Amaltas, Hind.	Cassia Fistula, *Linn.*	34, 131, 147
Amari, Ass	Terminalia tomentosa, *W. & A.*	104
Amba, Hind	Mangifera indica, *Linn*	66, 147
Ambe-halad, Bombay	Curcuma aromatica, *Salisb.*	147
Ambi, Hind.	Mangifera indica, *Linn.*	66, 147
Amri „		
Andaka, Tel.	Boswellia serrata, *Roxb.*	29
Andaman Marble-wood.	Diospyros Kurzii, *Hiern.*	47
Andaman Padauk	Pterocarpus dalbergioides, *Roxb.*	81
„ *Zebra-wood*	Disopyros Kurzii, *Hiern.*	47
Andamargal, Tel	Carallia integerrima, *DC.*	32
Andamurla „		
Andi „		
Andipunar „		
Anduga „	Boswellia serrata, *Roxb.*	29
Anduka „ „		
Anemin, Tam	Terminalia tomentosa, *W. & A.*	104, 132
Anemui „		
Animal products	....	151
Anjan, Hind.	Hardwickia binata, *Roxb*	54, 114
Annu, Kan.	Stephegyne parvifolia, *Korth.*	98
Aonla, Hind.	Phyllanthus Emblica, *Linn.*	132, 134
Apricot	Prunus armeniaca, *Linn.*	148
Apta, Mar.	Bauhinia racemosa, *Lam.*	115, 155
Arale, Kan.	Lagerstromia, lanceolata, *Wall.*	64
Arsanatega, Kan.	Adina cordifolia, *Hook. f.*	13
Arthi, Tam.	Hardwickia binata, *Roxb.*	54
Arun samtigi, Kan.	Adina cordifolia, *Hook, f.*	13
Asaina Hind.	Terminalia tomentosa, *W. & A*	104, 132
Asainda „	Ougeinia dalbergioides, *Benth.*	71, 115
Asan, Hind.	Terminalia tomentosa, *W. & A.*	104, 132
Asid „	Lagerstromia parviflora, *Roxb*	64
Asna, Hind.	Terminalia tomentosa, *W. & A.*	104, 132
Assain, Hind.		
Attaka, Kan	Stephegyne parvifolia, *Korth*	98
Awga, U Burma	Carallia integerrima, *DC.*	32
Awie, Tam.	Holopteleа intergrifolia, *Planch*	57
Aya „		
Ayama, Tam.	Careya arborea, *Roxb.*	34, 116
Ayil, Tam.	Holoptelea integrifolia, *Planch.*	57
Ayima, Ayma, Tam.	Careya arborea, *Roxb.*	34, 116

B

		Page.
Babul, Hind.	Acacia arabica, *Willd.*	11, 129, 134
Babur „		
Bael, Hind.	Ægle Marmelos, *Correa.*	146
Baga, Tam.	Acacia Catechu, *Willd.*	12, 123
Bagala, Kan.	Mimusops Elengi, *Linn.*	69
Bage, Kan	Albizzia Lebbek, *Benth.*	14
Bahan, Sind	Populus euphratica, *Olivier*	80
Bakkala, Kan.	Mimusops Elengi, *Linn.*	69
Bakla, Hind.	Anogeissus latifolia, *Wall.*	16
Bákli „	„ „ „ Lagerstromia parviflora, *Roxb.*	16 65
Bakul, Kan.	Mimusops Elengi, *Linn.*	69
Balai „	Diospyros Melanoxylon, *Roxb.*	47
Balandur, Kan.	Lagerströmia lanceolata, *Wall.*	64
Beleric myrabolums	Terminalia belerica, *Roxb.* (fruits)	134
Bamboos	..	148
Bamboo seed	...	148
Bambwe, Burm.	Careya arborea, *Roxb.*	34, 116
Ban, Hind.	Quercus incana, *Roxb.*	88
Banana	Musa spp	113
Banapu, Kan.	Terminalia tomentosa, *W. & A.*	104, 132
Bandara „	Lagerstromia lanceolata, *Wall*	64
Bandarlati, Beng.	Cassia Fistula, *Linn.*	34, 131, 147
Bandaru, Tel.	Adina cordifolia, *Hook f.*	13
Bangka, Beng.		
Banj, Hind.	Quercus incana, *Roxb.*	88
Bankli „	Anogeissus latifolia, *Wall.*	16
Bansa „	Albizzia odoratissima, *Benth.*	16
Banyan	Ficus bengalensis, *Linn.*	51, 115
Bar, Hind.		
Baraga, Tel.	Bombax malabaricum, *DC.*	28
Bargat, Hind.	Ficus bengalensis, *Linn.*	51, 115
Barhat „	Artocarpus Lakoocha, Roxb.	23
Bark drugs	.	144
„ *dyes*	..	135
Bas, Hind.	Albizzia odoratissima, *Benth.*	16
Bassein, Hind.		
Bataganapu, Tel.	Stephegyne parvifolia, *Korth.*	98
Batakadapu, Kan.		
Batala, Kan	Grewia tiliæfolia, *Vahl.*	53
Batta, Tel.	Barringtonia acutangula, *Gærtn.*	23
Battaganapa, Tel.	Stephegyne parvifolia, *Korth.*	98
Bogana, C. P.	Holoptelea integrifolia, *Planch.*	57
Behra „	Chloroxylon Swietenia, *DC.*	41
Behru „		
Bejalu, Kan.	Anogeissus latifolia, *Wall.*	16
Bejjal „		
Belimathi, Kan.	Lagerstromia lanceolata, *Wall*	64
Bemu, Kan.	Melia indica, *Brandis.*	67
Benga „	Pterocarpus Marsupium, *Roxb.*	84,
Bengal Kino.	...	137
Bengha, Kan.	Albizzia Lebbek, *Benth.*	14
Benteak, Tam.	Lagerströmia lanceolata, *Wall*	64
Bentik, Kan		
Ber, Hind.	Ficus bengalensis, *Linn.*	51, 115
Bersa, Hind.	Albizzia odoratissima, *Benth.*	16
Beti, Kan.	Dalbergia latifolia, *Roxb.*	43
Betta-bevan Kan.	Melia indica, *Brandis.*	67
Betta honne „	Ougenia dalbergioides, *Benth.*	71, 115
Bevina, Kan.	Melia indica, *Brandis*	67
Bevu „		
Bhabar grass	Ischæmum angustifolium, *Hack.*	117
Bhandir, Hind.	Albizzia odoratissima, *Benth.*	16
Bhimliss.	Terminalia Chebula, *Retz.* (Myrabolams)	133
Bhor, Mar.	Zizyphus Jujuba, *Lam.*	147
Biggiri Kan.	Anogeissus latifolia, *Wall.*	16
Bihri, C. P.	Chloroxylon Swietenia, *DC.*	41
Bija, Hind.	Pterocarpus Marsupium, *Roxb.*	84, 137
Bijal, Kan.	Anogeissus latifolia, *Wall.*	16
Bijasal, Hind. Kan.	Pterocarpus Marsupium *Roxb.*	84, 137
Bijasar, Hind.		

PAGE.

Bilgu, Tel. . Chloroxylon Swietenia, *DC.* . 41
Bili matti, Kan. . Terminalia paniculata, *W. & A* . 103
Bilkumbi „ . Albizzia odoratissima, *Benth.* . 16
Billa, Tel. . Chloroxylon Swietenia, *DC* . 41
Billawar, Kan. . Albizzia odoratissima, *Benth.* . 16
Billinandi Kan. . Lagerstrómia lanceolata, *Wall* . 64
Billu, Tel. } Chloroxylon Swietenia, *DC.* 41
Billudu, Tel.
Bilmara, Kan. } Albizzia odoratissima, *Benth.* . 16
Bilwara, Kan., Tam.
Bio, Guz. . Pterocarpus Marsupium. *Roxb.* 84, 137
Biridi, Kan. . Dalbergia Sissoo, *Roxb.* . 45
Black Plum . Eugenia Jambolana, *Lam.* . 50
Black-wood . Dalbergia latifolia, *Roxb.* . 43
Blue Pine . Pinus excelsa, *Wall* . 75, 139
Boaungza, Burm. . Bischofia javanica, *Blume* . 25
Bobbeakulpara, Kan. } Calophyllum tomentosum, *Wight* 31
Bobbi, Kan.
Boeh, Tel. . Xylia dolabriformis, *Benth* 107
Bohl, Beng. } Mimusops Elengi, *Linn.* . 69
Bokal, Kan
Boke, Hind. . Bischofia javanica *Blume.* . 25
Bokli, Kan. } Mimusops Elengi, *Linn* . 69
Boklu „
Bondareh, Bombay . Lagerstromia parviflora, *Roxb* . 65
Boothali, Tam. } Bombax malabaricum, *DC.* . 28, 115, 117, 128
„ Katkiluvai, Tam.
Bor, Hind. . Ficus bengalensis, *Linn.* . 51, 115
Borasu, Tam. . Chloroxylon Swietenia, *DC* . 41
Borladdu Kan. . Bombax malabaricum, *DC.* 28, 115, 117, 128
Borsáli, Guz. . Mimusops Elengi, *Linn.* . 69
Bot, Ass . Ficus bengalensis, *Linn* . 51, 115
Botuka, Tel . Stephegyne parvifolia, *Korth* . 98
Bovumara, Kan. . Hopea parviflora, *Bedd.* . 60
Buokhal, Kan. . Mimusops Elengi, *Linn.* . 69
Buda darini, Tel. Careya arborea, *Roxb* . 34, 116
Bude, Kan. . Dalbergia latifolia, *Roxb.* . 43
Bukal, Beng. . Mimusops Elengi, *Linn.* . 69
Bur, Beng. . Ficus bengalensis, *Linn* . 51, 115
Buraga, Tel. } Bombax malabaricum, *DC* . 28, 115, 117, 128
Bargao, Kan.
Burgi, Tel.
Burla, Kan.
Burma Padauk. . Pterocarpus macrocarpus, *Kurz.* . 82
Buruga, Kan., Tel. } Bombax malarabicum, *DC.* . 28, 115, 117, 128
Burugadamara, Kan.
Burus, Tam. . Chloroxylon Swietenia, *DC.* . 41
Busi, Tel. . Schleichera trijuga, *Willd.* . 92, 126
But, Beng. . Ficus bengalensis, *Linn.* . 51, 115
Buta kadambe, Tam. } Stephegyne parvifolia, *Korth.* . 98
„ kadambu „
Butale, Kan. . Grewia tiliæfolia, *Vahl.* . 53, 115
Butter, vegetable . 128
„ *Sal.* . 128

C

Camphor . 124
Canes . 148, 149
Cardamoms . 145
„ *Greater or Nepal.* . 145
„ *Lesser or Malabar.* . 145
Cassia bark . 144
„ *Oil* . 144
Castilloa rubber . 141
Ceara „ . 141
Cedar, Moulmein } Cedrela Toona, *Roxb.* . 37, 135
„ *Red*
Chabuku, Kan. . Casuarina equisetifolia, *Forst.* . 36
Chagadai, Kan. } Schleichera trijuga, *Willd.* . 92, 126
Chagate „
Chakota, Kan. „ „ . 92, 126
Challaholedasal, Kan } Lagerstromia Flos-Reginæ, *Retz.* 62
Challaholemath, „
Challaue, Kan. . Dipterocarpus turbinatus, *Gærtn. f.* . 49, 140
Chama, Ass. } Artocarpus Lakoocha, *Roxb.* . 2
Chamua „
Chanangi, Kan. . Lagerströmia parviflora, *Roxb.* . 6

Chandal, Hind. } Santalum album, *Linn.* . 89
Chandan „
Chandanam, Tel, Tam.
Chaplash, Beng. } Artocarpus Chaplasha, *Roxb.* . 21
Chaplio, Beng.
Charachi, Tel. Grewia tiliæfolia, *Vahl* . 53, 115
Charcoal . 124
Chavuki, Tam. Casuarina equisetifolia, *Forst.* . 36
Chaya, Burm. . Mimusops Elengi, *Linn* . 69
Cheddy, Tam Barringtonia acutangula, *Gærtn* . 23
Chelampai, Tam. . Stephegyne parvifolia, *Korth.* . 98
Chella baagi, Kan. Albizzia odoratissima, *Benth.* . 16
Cheningi, Kan. . Lagerstromia parviflora, *Roxb.* . 65
„ Tel . „ Flos-Reginæ, *Retz.* . 62
Chennagi, Kan. } „ parviflora, *Roxb.* . 65
Chennangi, Tel.
Chermanu „ . Anogeissus latifolia, *Wall.* . 16
Cherry, wild Prunus Padus, *Linn.* . 148
Chestnut, Indian Castanopsis Hystrix, *A DC* . 35
Chichra, Hind. Butea frondosa, *Roxb.* . 30
Chilbil, C P. } Holoptelea integrifolia, *Planch* . 57
Chilmil, C P
Chinangi, Tel. . Lagerstromia parviflora, *Roxb* . 65
Chinduga, Tel } Albizzia odoratissima, *Benth.* . 16
„ Sirisi, Tel
Chinese tallow tree Sapium sebiferum, *Roxb.* . 128
Chinna kadambu, Tam. Stephegyne parvifolia, *Korth.* . 98
Chinnanjee, Tam. . Lagerstromia parviflora, *Roxb.* . 65
Chir, Garhwal, Kumaun. Pinus longifolia, *Roxb* . 77, 136, 139
Chiriman, Tel . Anogeissus latifolia *Wall* . 16
Chironji, C. P. . Buchanania latifolia, *Roxb.* . 128, 138
Chitta, Kan . Boswellia serrata, *Roxb.* . 20
Chittage, Tel. Dalbergia latifolia, *Roxb.* . 43
Chouk, Tam } Casuarina equisetifolia, *Forst.* . 36
Chowku, Tel.
Chunungi, Bombay . Lagerstromia parviflora, *Roxb.* . 65
Cigarette leaves . 155
Cinnamon . 124
Cochin oil . 121
Cocoons, silk . 154
Colophony . 139
Congu, Kan. . Stephegyne parvifolia, *Korth.* . 98
Copal tree, Indian Vateria indica, *Linn* . 107, 128, 136, 138
Copal resin . 138
Cotton tree . Bombax malabaricum, *DC.* . 28, 115, 117, 128
Cummi, Tam. . Gmelina arborea, *Roxb.* . 52
Cutch . 123
Cypress, Himalayan Cupressus torulosa, *Don.* . 42

D

Dabria, Bombay . Anogeissus latifolia, *Wall.* . 16
Daddal, Kan. . Careya arborea, *Roxb.* . 34, 116
Dadsal „ . Grewia tiliæfolia, *Vahl.* . 53, 115
Dahu, Hind. . Artocarpus Lakoocha, *Roxb.* . 23
Da-kóm, Beng . Adina cordifolia, *Hook. f.* . 13
Damadi, Tel. . Diospyros Melanoxylon, *Roxb.* . 47
Dammar . 138, 139
„ *Pweyet.* ... 139
„ *Rock* 139
„ *White* 138
Dar, Nep. . Bœhmeria rugulosa, *Wedd.* . 26
Dargu, Tel. . Ougeinia dalbergioides, *Benth.* 71, 115
Darshana, Tel . Albizzia Lebbek, *Benth.* . 14
Date, wild . Phœnix sylvestris, *Roxb.* . 113
Dauldhak Hind. . Erythrina suberosa, *Roxb.* . 50
Dehua, Beng. . Artocarpus Lakoocha, *Roxb.* . 23
Deodar, Hind. } Cedrus Deodara, *Loudon*, var Libani *Barrel* . 38, 122
Dephul, Beng. . Artocarpus Lakoocha, *Roxb.* . 23
Devdari, Kan. . Cedrela Toona, *Roxb.* . 37, 135
Devidiar, Hind. } Cupressus torulosa, *Don.* . 42
Devidwar „
Dewa, Ass. . Artocarpus Lakoocha, *Roxb.* . 23
Dhak, Hind. . Butea frondosa, *Roxb.* . 30, 115, 135, 138
Dhamana, Guz. } Grewia tiliæfolia, *Vahl.* . 53, 115
Dhamin, Hind.
Dhamni, Kan.

		PAGE.
Dhan, Hind.	Anogeissus latifolia, *Wall.* Artocarpus Lakoocha, *Roxb.*	16 23
Dhaula ,,	Anogeissus latifolia, *Wall*	16
Dhaura ,,	Lagerstromia parviflora *Roxb.* Anogeissus latifolia, *Wall.*	65 16
Dhauri ,,	,, ,, ,, Lagerstromia parviflora, *Roxb*	65
Dhawa ,,	Anogeissus latifolia, *Wall*	16
Dhoode, Kan	Bombax malabaricum, *D.C.*	28, 115, 117, 128
Dhowda, Guz. Dhudi, Hind	Holarrhena antidysenterica, *Wall*	57, 117, 144
Dhudimara, Kan.	Bombax malabaricum, *DC.*	28, 115, 117, 128
Dhup roots, Himalayan	Jurinea macrocephala, *Benth.*	144
Dhupa, Kan.	Boswellia serrata, *Roxb* Vateria indica, *Linn.*	29 107, 128, 136, 138
Dhupada ,, Dhup, maram, Tam.	Vateria indica, *Linn.*	107, 128, 136, 138
Didok, Burm. Didu ,,	Bombax insigne, *Wall.*	27
Dindal, Dindaga, Dindu, Dinduga, Dindu, Kan.	Anogeissus latifolia, *Wall.*	16
Dirasana, Dirasanan Dirisina, Tel	Albizzia Lebbek, *Benth*	14
Distillation products		120
Divi-Divi.	Cæsalpinia coriaria *Willd.*	134
Dodaga, Tel.	Adina cordifolia, *Hook f.*	13
Doddabagi, Kan.	Albizzia Lebbek, *Benth.*	14
Doddaippi ,,	Bassia latifolia, *Roxb*	24, 124, 125
Dohu, Hind.	Anogeissus latifolia, *Wall.*	16
Dowa, Ass.	Artocarpus Lakoocha, *Roxb.*	23
Dowla, Hind., Bombay.	Holarrhena antidysenterica, *Wall*	57, 117, 144
Drugs		142
,, *Fruit and Seed*		144
,, *Root*	...	142
, *Stem and bark*	..	144
Drum-stick tree	Moringa pterygosperma, *Gærtn.*	116, 137, 148
Dudagu, Tel	Adina cordifolia, *Hook f.*	13
Dudcory, Ass.	Holarrhena antidysenterica, *Wall.*	57, 117, 144
Dudeppa, Tel.	Careya arborea, *Roxb*	34, 116
Dudhi, Hind	Holarrhena antidysenterica *Wall.*	57
Dudi, Ass.	Dæmonorops Jenkinsianus, *Mart.*	150
Dudippi, Tel	Careya arborea, *Roxb.*	34
Dumbi, Kan.	Diospyros Ebenum, *Koenig.*	46
Dumper, Tel. Dumperti ,, Dumpili, Kan. Dumpini, Tel.	Odina Wodier, *Roxb.*	70, 116, 132, 137
Dumpri Dupa maram, Kan. Dupadu, Tel	Vateria indica, *Linn.*	107
Dyes	.. ...	129
Dye-flowers	.. ...	135
Dyes, Bark	.. ...	135
,, *Root*	. .	135
,, *Wood*	.. ..	134

E

Eagle tree	Aquilaria Agallocha, *Roxb.*	122
East India Walnut	Albizzia Lebbek, *Benth.*	14
Ebans, Hind. *Ebony*	Diospyros Ebenum, *Koenig.*	46
Edible Fruits	.. ...	147
,, *Grass seeds*	.. . .	148
Edible Products	.. ...	147
,, *Roots*	.. .	147
Eikmwe, Upper Burma.	Lagerströmia Flos-Reginæ, *Retz.*	62
Elephants	..	154
Elupa, Tam.	Bassia latifolia, *Roxb.*	24, 124, 125
Eng, Burm.	Dipterocarpus tuberculatus, *Roxb.*	48, 140
Ennai, Tam.	,, turbinatus, *Gærtn. f.*	49, 140
Erra chandanam, Tel.	Pterocarpus santalinus, *Linn. f.*	86
Eruvadi, Tam.	Dalbergia latifolia, *Roxb.*	43
Eruvalu, Tel.	Xylia dolabriformis, *Benth.*	107

F

Fever-nut tree	Cæsalpinia Bonducella, *Roxb.*	147
Fibres from leaves		111
,, *Stem and bast*		114
Flosses		116
Flour		155
Flowers, dye		135
Fruit drugs		144
Fruits, edible		147

G

Gadava, Tel. Gadha, Tel	Careya arborea, *Roxb.*	34, 116
Gainti, Hind.	Bœhmeria rugulosa, *Wedd*	26
Gali, Kan.	Casuarina equisetifolia, *Forst.*	36
Gallu, U P.	Taxus baccata, *Linn.*	99
Gambari, Gambhar, Gamhar, Hind	Gmelina arborea, *Roxb.*	52
Gandada, Kan	Santalum album, *Linn.*	89
Gandagheri, Kan	Cedrela Toona, *Roxb*	37, 135
Gandha, Kan	Santalum album, *Linn.*	89
Gangaw, Burm.	Mesua ferrea, *Linn.*	68, 127
Ganjal Kan	Careya arborea, *Roxb.*	34, 116
Garal, Ass	Dæmonorops Jenkinsianus, *Mart.*	150
Garra ,,	,, ,, ,,	150
Garso, Hind	Albizzia Lebbek, *Benth.*	14
Gaul Kan.	Careya arborea, *Roxb*	34, 116
Gauri bet, Nep	Calamus acanthospathus, *Griff.*	150
Gausam, Hind.	Schleichera trijuga, *Willd.*	92, 126
Gavuldu, Kan. Gawagilu, Kan. Geemmadi-tekku Tel	Careya arborea, *Roxb.*	34, 116
Geli, U. P.	Taxus baccata, *Linn*	99
Gendam, Tel	Santalum album, *Linn.*	89
Genthi, Genti, Hind. Geti, Hind	Bœhmeria rugulosa, *Wedd.*	26
Gette, Tam.	Dalbergea Sissoo, *Roxb.*	45
Ghari am, Ass	Mangifera indica. *Linn.*	66, 147
Gike, Tel.	Diospyros Melanoxylon, *Roxb.*	47
Ginjan, Hind.	Odina Wodier, *Roxb.*	70, 116, 132, 137
Girmala, Guz	Cassia Fistula, *Linn*	34, 131, 147
Girya, C P., Berar	Chloroxylon Swietenia, *DC.*	41
Gobalu, Kan	.	41
Gobli, Kan.	Acacia arabica, *Willd*	11, 129, 134
Gobra nairut, Kan	Bischofia javanica, *Blume.*	25
Godan, Kan Godda, Kan Goddel ,,	Odina Wodier, *Roxb.*	70, 116, 132, 137
Godhunchi, Kan	Albizzia odoratissima, *Benth.*	16
Gojal, Kan.	Odina Wodier, *Roxb.*	70, 116, 132, 137
Goli, Kan.	Ficus bengalensis, *Linn.*	51, 115
Golpatta	Nipa fruticans, *Wurumb*	113
Gomari, Ass. Gongel, Ken.	Gmelina arborea, *Roxb.*	52
Gosum, Hind.	Schleichera trijuga, *Willd.*	92, 126
Goth Bor tree	Zizyphus xylopyra, *Willd.*	134
Grasses, fibre		117
,, *fodder*		119
,, *thatching*		118
Grass oil	.....	120
Grass seeds	..	148
Grazing		119
Gugal, *gum*	Boswellia serrata, *Roxb.* (Gum)	29
Gugal, Tel.	Shorea robusta, *Gærtn. f.*	93, 128 132, 136
Guggilam, *Tel.*	,, ,, ,, Boswellia serrata, *Roxb,*	93 29
Gugle, Kan.	Vateria indica, *Linn.*	107, 128, 136, 138

		PAGE.
Gugul, Kan.	Odina Wodier, *Roxb.*	70, 116, 132, 137
Gugulu, Tam.	Boswellia serrata, *Roxb.*	29
Gull, Tam.	Gmelina arborea, *Roxb.*	52
Gums	.....	136
Gum Arabic	.....	136
,, *Katira*	......	137
,, *Kino*		137
,, ,, *tree*	Pterocarpus Marsupium, *Roxb.*	84, 137
,, *resins*	......	136
Gumadi, Tam.	Gmelina arborea, *Roxb.*	52
Gumar, Beng.		
Gumar tek, Tel.		
Gumbar, Beng.		
Gumhar, Hind.		
Gumitaku, Tel.		
Gummadi ,,		
Gumpan, Tel	Odina Wodier, *Roxb.*	70, 116, 132, 137
Gumpani ,,		
Gumpina ,,		
Gumpini ,,		
Gumpna ,,		
Gumti, Kan	Gmelina arborea, *Roxb.*	52
Gumudu, Tel		
Gundada, Kan	Sanatalum album, *Linn.*	89
Guneri, Guz.	Cochlospermum Gossypium, *DC.*	117, 137
Gurjan, Beng.	Dipterocarpus turbinatus, *Gærtn, f.*	49, 140
,, *oil*		140
Gurmata, Guz.	Cassia Fistula, *Linn*	34, 131, 147
Gyo, Burm.	Schleichera trijuga, *Willd.*	92, 126

H

Hadri, Guz.	Terminalia tomentosa, *W & A.*	104, 132
Haladwan, Guz.	Adina cordifolia, *Hook, f.*	13
Halasu, Kan.	Artocarpus integrifolia, *Linn. f.*	22, 147
Haldu, Hind.	Adina cordifolia, *Hook, f.*	13
Hale, Kan	Holarrhena antidysenterica, *Wall*	57, 117, 144
Halsina, Kan.	Artocarpus integrifolia, *Linn. f*	22, 147
Halsu, Kan.		
Halusu ,,		
Hardu, Hind	Adina cordifolia, *Hook, f.*	13
Heb-bevu, Kan.	Melia indica, *Brandis*	67
Hebhalsu, Kan.	Artocarpus integrifolia, *Linn. f.*	22
Hedde ,,	Adina cordifolia, *Hook, f.*	13
Heddi, Mar.		
Hedu, Kan.	Stephegyne parvifolia, *Korth.*	98
Hemp	Cannabis sativa, *Linn*	115
Hendol, Ass.	Barringtonia acutangula, *Gærtn.*	23
Henduripoma, Ass.	Cedrela Toona, *Roxb.*	37, 135
Hennumatli, Kan.	Careya arborea, *Roxb.*	34, 116
Hottiga ,,	Adina cordifolia, *Hook. f.*	13
Hijal, Beng.	Barringtonia acutangula, *Gærtn.*	23
Himalayan cypress	Cupressus torulosa, *Don*	42
,, *dhup.*	Jurinea macrocephala, *Benth*	144
Hingori, *Ass.*	Castanopsis Hystrix, *A DC.*	85
Hirda, Mar.	Terminalia Chebula, *Retz.*	133
Hirih, Ass.	Albizzia Lebbek, *Benth.*	14
Hirojah, C. P.	Cassia Fistula, *Linn*	34, 131, 147
Hnabe, Burm.	Odina Wodier, *Roxb.*	70, 116, 132, 137
Hnaw ,,	Adina cordifolia. *Hook, f*	13
Hog plum	Spondias mangifera, *Pers.*	147
Hole-dasal, Kan.	Lagerstömia Flos-Reginæ, *Rtez.*	62
Hole kauva. ,,	Barringtonia acutangula, *Gærtn.*	23
Hona, Kan.	Calophyllum Inophyllum, *Linn.*	31, 128, 138
Hongalu, Kan.	Terminalia paniculata, *W & A.*	103
Honal ,,		
Hond ,,	Pterocarpus Marsupium, *Roxb.*	84, 137
Honey		153
Hongal, Kan.	Terminalia paniculata, *W. & A.*	103
Honge ,,	Bassia latifolia, *Roxb.*	24, 124, 125
Honne, Kan.	Pterocarpus Marsupium, *Roxb.* Calophyllum Inophyllum, *Linn.* Pterocarpus Santalinus, *Linn. f.*	84, 137 31 86
Horns		154
Horse-radish tree	Moringa pterygosperma, *Gærtn.*	116, 137, 148
Huluva, Hulave, Hulve, Kan.	Terminalia paniculata, *W. & A.*	103
Hunab, Kan.	Terminalia paniculata, *W. & A.*	103
Huragalu, Kan.	Chloroxylon Swietenia, *DC.*	41

I

Ibbadi, Kan.	Dalbergia latifolia, *Roxb*	43
Ijal, Hind.	Barringtonia acutangula, *Gærtn.*	23
Illavam, Tam.	Bombax malabaricum, *DC*	28, 115, 117, 128
Illavu ,,		
Illupathla, Kan.	Vateria indica, *Linn.*	107, 128, 136, 138
Illupei, Tam.	Bassia latifolia, *Roxb*	24, 124, 125
Im, Kan.	Hopea parviflora, *Bedd*	60
In, Burm	Dipterocarpus tuberculatus, *Roxb*	48, 140
Indarjau, Hind.	Holarrhena antidysenterica, *Wall*	57, 117, 140
Indian Chestnut	Castanopsis Hystrix, *A. DC.*	35
,, *Copal tree*	Vateria indica, *Linn.*	107
,, *Laburnum*	Cassia Fistula, *Linn*	34, 131, 147
,, *Red wood*	Soymida febrifuga, *Adr Juss*	97
Indrajau, Bombay	Holarrhena antidysenterica, *Wall.*	57, 117, 140
Indrajav, Hind.		
Ingar, Hind.	Barringtonia acutangula, *Gærtn*	23
Injar ,,		
Innumaddi, Tel.	Terminalia tomentosa, *W. & A.*	104, 132
Ippa, Tel.	Bassia latifolia, *Roxb.*	24, 124, 125
Ippe ,,		
Ippi, Kan.		
Ippi, Tel		
Iridi, Tel	Dalbergia latifolia, *Roxb.*	43
Iron wood of Burma	Xylia dolabriformis, *Benth*	107
Iron wood tree	Mesua ferrea, *Linn.*	68
Irubogam, Tam.	Hopea parviflora, *Bedd.*	60
Irugachava, Tel	Dalbergia latifolia, *Roxb*	43
Irul, Tam.	Xylia dolabriformis, *Benth.* Mesua ferrea, *Linn*	107 68
Irumbogam, Tam	Hopea parviflora, *Bedd*	60
Iti, Tam.	Dalbergia latifolia, *Roxb*	43
Itigi, Tel		
Itola, U. P	Cassia Fistula, *Linn*	34, 131, 147
Itti, Tam.	Dalbergia latifolia, *Roxb.*	43
Ivory		154
Iyali, Kan	Cedrela Toona, *Roxb*	37, 135

J

Jack tree	Artocarpus integrifolia, *Linn f*	22, 147
Jagadi, Kan	Schleichera trijuga, *Willd*	92, 126
Jagarwah, C. P	Cassia Fistula, *Linn*	34, 131, 147
Jali, Kan.	Acacia arabica, *Willd*	11, 129, 134
Jaligida, Kan.	Calamus tenuis, *Roxb.*	150
Jam, Hind, Beng	Eugenia Jambolana, *Lam.*	50, 132, 147
Jaman, Hind		
Jamba, Tel.		
Jamba, Mar	Xylia dolabriformis, *Benth.*	107
Jambe, Kan.		
Jambu, Hind.		
Jambu, Merwara.	Eugenia Jambolana, *Lam*	50, 132, 147
Jamni, Hind.		
Jamu, Ass.		
Jamun, Hind		
Jana, Tel.	Grewia tiliæfolia, *Vahl.*	53, 115
Jani, Kan.		
Jarul, Beng.	Lagerstromia Flos-Reginæ, *Retz*	62
Jati-koroi, Ass.	Albizzia odoratissima, *Benth.*	16
Jhingan, Hind.	Odina Wodier, *Roxb.*	70, 116, 132, 137
Jitangi, Tel.	Dalbergia latifolia, *Roxb.*	43
Jitegi, Tel.		
Jitangi, Tel.		
Jiyal, Beng.	Odina Wodier, *Roxb.*	70, 116, 132, 137
Jubbalpores	Terminalia Chebula, *Retz.* (Myrabolans).	133

PAGE.

Jugar, Hind. . Barringtonia acutangula, *Gærtn.* . 23
Jute . . { Corchorus capsularis, *Linn* . 115
{ „ olitorius, *Linn.* . . 115

K

Kachri, Hind. . . Holarrhena antidysenterica, *Wall* 57, 117, 144
Kachu, Kan. . . Acacia Catechu, *Willd* 12, 123
Kadaba, Kan. . { Stephegyne parvifolia, *Korth* . 98
{ Adina cordifolia, *Hook f.* . . 13
Kadali, Tam. . . Lagerstromia Flos-Reginæ, *Wall* 63
Kadamba, Kan. . }
Kadambe, Tel } Adina cordifolia, *Hook f.* . . 13
Kadambe, Kan , Tel. Stephegyne parvifolia, *Korth* . 98
Kadamic, Tel . }
Kadani, Kan . . } Barringtonia acutangula, *Gærtn.* . 23
Kadapalai, Tam. . Holarrhena antidysenterica, *Wall* 57, 117, 144
Kadawar, Kan . }
Kaddam, Hind . } Stephegyne parvifolia, *Korth.* . 98
Kaddappay-maram, Tam. Barringtonia acutangula, *Gærtn* 23
Kadiala, Kan. . . }
Kadwar . } Stephegyne parvifolia, *Korth.* . 98
Kæm, Hind . . }
Kaggali, Kan. . . }
Kagli, Kan . . } Acacia Catechu, *Willd* . 12, 123
Kai-bevu, Kan . Melia indica, *Brandis* . . 67
Kail, Hind Pinus excelsa, *Wall* . 75, 136, 139
Kaimal, Hind . . Odina Wodier, *Roxb* 70, 116, 132, 137
Kain, Hind . Bischofia javanica, *Blume* . 25
Kaka-tati, Tam. Diospyros Ebenum, *Koenig.* 46
Kake, Kan . }
Kaki, Tam. . } Cassia Fistula, *Linn.* 34, 131, 147
Kakibevu, Kan. . Melia indica, *Brandis* . 67
Karkai, Kan . }
Kakke „ . . } Cassia Fistula, *Linn.* . 34, 131, 147
Kakria, Hind. . . Butea frondosa, *Roxb* 30, 115, 135, 137
„ Guz . Lagerströmia parviflora, *Roxb.* . 65
Kalaruk, Kan . Dalbergia latifolia, *Roxb* . . 43
Kala siris, Merwara. Albizzia odoratissima, *Benth.* 16
Kali papri Hind . Holoptelea integrifolia, *Planch* 57
Kali siris, Hind Albizzia odoratissima, *Benth.* . 16
Kalkambi, Tam. Careya arborea, *Roxb.* . . 34, 116
Kallale, Kan . . Mimusops Elengi, *Linn* . . 69
Kallam, Hind . Stephegyne parvifolia, *Korth.* . . 98
Kalo-sarasio, Guz Albizzia odoratissima, *Benth.* . . 16
Kalsis, Hind. . „ Lebbek, *Benth.* . . . 14
Kal-thuringi, Tam. . „ odoratissima, *Benth.* . 16
Kamada, Tel. . Adina cordifolia, *Hook. f.* . 13
Kamara, Kan. . . }
Kamba, Tel } Hardwickia binata, *Roxb.* . . 54
Kamba botuka, Tel. Stephegyne parvifolia, *Korth.* . 98
Kambhar, Hind Gmelina arborea, *Roxb* . . 52
Kambili-pishin, Tam. . Careya arborea, *Roxb* . 34, 116
Kamela powder . Mallotus philippinensis powder 135
Kamlai, Hind . Odina Wodier, *Roxb.* 70, 116, 132, 137
Kamma regu, Tel. Artocarpus Lakoocha, *Roxb.* . . 23
Kanapa, Tel. . . Barringtonia acutangula, *Gærtn* . 23
Kanapu „ . . Adina cordifolia, *Hook f.* . 13
Kandru, C P. . . Holoptelea integrifolia, *Planch* . 57
Kangei, Hind. . . Stephegyne parvifolia, *Korth.* 98
Kanjee vadychan, Tam. Schleichera trijuga, *Willd.* . 92, 126
Kanju, Hind . Holoptelea integrifolia, *Planch.* . 57
Kankrel, Hind. . Butea frondosa, *Roxb.* 30, 115, 135, 137
Kanopa, Tel. . Barringtonia acutangula, *Gærtn.* . 23
Kanthal, Hind. . Artocarpus integrifolia, *Linn. f.* 22, 147
Kanu, Kan. . . Stephegyne parvifolia, *Korth.* . . 98
Kanyin, Burm. . }
Kanyinni, Burm. . } Dipterocarpus turbinatus, *Gærtn f.* 49, 140
Kanyin wettaung, Burm. }
Kanzaw, Burm. . Bassia latifolia, *Roxb.* . 24, 124, 125
Kapock 116, 124
Karacha, Kan. . }
Karachi „ . } Hardwickia binata, *Roxb.* . . 54
Karalli, Tel. . . Carallia integerrima, *DC.* . . 32
Karam, Hind. . . Adina cordifolia, *Hook. f.* . . 13
Karangalli, Tam. . Acacia Catechu, *Willd.* . . 12, 123

PAGE.

Karanji, C. P. . Holoptelea integrifolia, *Planch.* . 57
Karan kongu, Tam Hopea parviflora, *Bedd.* . . 60
Karchi, Hind. . Holarrhena antidysenterica, *Wall.* . 57, 117, 144
Karemara, Kan. . Diospyros Ebenum, *Koenig.* . . 46
Kari, Hind. . . Holarrhena antidysenterica, *Wall.* . 57, 117, 144
Karimadi, Kan . }
Karimardu, Tam }
Karimaruthio, Kan. } Terminalia tomentosa, *W. & A* 104, 132
Karimatti „ . }
Karimutal, Kan Ougeinia dalbergioides, *Benth.* 71, 115
Karinga, C P Holoptelea integrifolia, *Planch.* 57
Karkacha, C. P. Cassia Fistula, *Linn.* . . 34, 131, 147
Karma, Hind. . }
Karmi, Tel. . } Stephegyne parvifolia, *Korth.* . 98
Karra, Hind. Holarrhena antidysenterica, *Wall.* . 57
Karra marda, Tam Terminalia tomentosa, *W & A.* .104, 132
Karri, Kan . Diospyros Ebenum, *Koenig.* . 46
Karrijali, Kan Acacia arabica, *Willd.* 11, 129, 134
Karu maruthu, Tam. Terminalia tomentosa, *W. & A.* 104
Karumporasu „ Chloroxylon Swietenia, *DC.* . . 41
Karumthumbi „ Diospyros Melanoxylon, *Roxb* . 47
Karungali, Tam. Acacia Catechu, *Willd.* . 12, 123
Karunkali „ }
Karunthali „ . } Diospyros Ebenum, *Koenig.* . . 46
Karunthoverai, Tam }
Karunthuvarai, Tam „ Melanoxylon, *Roxb.* . 47
Karuvagai, Tam }
Karuvage, Tel. } Albizzia odoratissima, *Benth* . 16
Karuvelam, Tam. . Acacia arabica, *Willd* 11, 129, 134
Karvaghe „ Albizzia odoratissima, *Benth* 16
Kashmala, Hind. Odina Wodier, *Roxb* 70, 116, 132, 137
Kasmiri, Hind Gmelina arborea, *Roxb.* . . . 52
Katbaghi, Kan . Albizzia Lebbek, *Benth.* . . 14
Katdhaura, Hind. Lagerstromia parviflora, *Roxb.* . 65
Kath . 123
Kathal, Hind. . }
Kathar, „ . } Artocarpus integrifolia, *Linn* 22, 147
Kathit, Burm . Erythrina suberosa, *Roxb* . 50
Katho bet, Beng. Calamus viminalis, *Willd.* 150, 151
Katillippi, Tam Bassia latifolia, *Roxb.* . 24, 124, 125
Katira gum . 137
Katol, Hind Artocarpus integrifolia, *Linn. f.* 22, 147
Kattek, Tam Careya arborea, *Roxb* . . 34, 116
Kattuelavam, Tam. Bombax insigne, *Wall* . . 27
„ „ . „ malabaricum, *DC.* . . 28
Kattu vagal „ }
Kat vage, Tel. . . } Albizzia Lebbek, *Benth.* . . 14
Kauchia, Tam. Holoptelea integrifolia, *Planch.* 57
Kaulu, *Kan.* Careya arborea, *Roxb* . . 34, 116
Kaur, Kashmere . Saussurea Lappa, *Clarke* . . 143
Kaura, Hind. . Holarrhena antidysenterica, *Wall.* . 57, 144
Kaval, Kan. . Careya arborea, *Roxb.* . . 34, 116
Kavani, Tam. . Cassia Fistula, *Linn* . 34, 131, 147
Kaviri, Tel . . Accacia Catechu, *Willd.* . . 12, 123
Kavne, Kan . . Careya arborea, *Roxb.* . . 34, 116
Kaya, Burm . . Mimusops Elengi, *Linn* . 69
Keelige, Kan . Erythrina suberosa *Roxb* . . 50
Koim, Hind . . Stephegyne parvifolia *Korth.* . . 98
Keli-kadam, Beng Adina cordifolia, *Hook. f.* . . 13
Kempu gandagheri, Kan. Cedrela Toona, *Roxb.* . . 37, 135
Kesara, Kan . Mesua ferrea, *Linn.* . . 68, 123
Khair, Hind . . Acacia Catechu, *Willd* . 12, 123
Khakda, Guz . . Butea frondosa, *Roxb.* 30, 115, 135, 137
Khamhar, Hind . }
Khammara „ . } Gmelina arborea, *Roxb* . . 52
Khas khas, „ . Vetiveria zizanioides, *Stap f.* . 120
Khoira, Ass. . . Acacia Catechu, *Willd.* . . 12, 123
Khor, Hind . Juglans regia, *Linn.* . . . 61
Khumbi, Hind. . Careya arborea, *Roxb.* . . 34, 116
Khut, Kashmere . Saussurea Lappa, *Clarke* 116, 143
Kiamil, Hind. Odina Wodier, *Roxb.* 70, 116, 132, 137
Kierpa, Beng. Carallia integerrima, *DC.* 32
Kilinji, Kan . . Cedrela Toona, *Roxb.* . 37, 135
Kimul, Hind. . . Odina Wodier, *Roxb.* . 70, 116, 132, 137
Kindal, Mar. . . Terminalia paniculata, *W. & A.* 103
Kino, Bengal . . . 137
„ *Gum* 137

		PAGE.
Kino, Medical	...	137
Kiralbhogi, Kan.	Hopea parviflora, *Bedd.*	60
Kirlabhogi, Kan.	Hopea parviflora, *Bedd.*	60
Kirijul, Bombay	Terminalia paniculata, *W. & A*	108
Kirribevu, Kan	Melia indica, *Brandis*	67
Kitoli, U. P.	Cassia Fistula, *Linn.*	34, 131, 147
Kittal, *Fibre*		112
Kodaga, Tel	Holarrhena antidysenterica, *Wall.*	57, 117, 144
Kodagapalei, Tam.		
Kodalaimukki ,,	Lagerstromia Flos-Reginæ, *Retz.*	62
Kodamuraka, Kan.	Holarrhena antidysenterica, *Wall.*	57, 117, 144
Koduvaporasu, Tam.	Chloroxylon Swietenia, *DC.*	41
Kohumba, Guz.	Melia indica, *Brandis*	67
Koir, Assam	Acacia Catechu, *Willd*	12, 123
Koira, Hind	Holarrhena antidysenterica, *Wall*	57, 117, 144
Kôkko, Burm	Albizzia Lebbek, *Benth*	14
Kolamukhi, Tel	Holarrhena antidysenterica, *Wall*	57, 117, 144
Konay, Tel.	Cassia Fistula, *Linn.*	34, 131, 147
Konda tangedu, Tel	Xylia dolabriformis, *Benth*	107
Konde, Kan	Cassia Fistula, *Linn.*	34, 131, 147
Kondrican, Tam.	Vateria indica, *Linn.*	107, 128, 136, 138
Kone, Tam	Cassia Fistula, *Linn.*	34, 131, 147
Kongu, Tam.	Hopea parviflora, *Bedd*	60
Konnai ,,	Cassia Fistula, *Linn*	34, 116
Konne, Kan.		
Kora, Hind.	Holarrhena antidysenterica, *Wall.*	67, 117, 144
Korai, Madras	Cyperus tegetum, *Roxb.*	120
Korchu Kan.	Holarrhena antidysenterica, *Wall.*	57, 117, 144
Koroi, Beng	Albizzia odoratissima, *Benth.*	16
Kosengi, Tel.	Schleichera trijuga, *Willd.*	92, 126, 152
Kosum, Hind.		
Kuar, Hind.	Holarrhena antidysenterica, *Wall.*	57, 117, 144
Kudsalu, Kan.		
Kudwal ,,	Stephegyne parvifolia, *Korth*	98
Kugli ,,	Acacia Catechu, *Willd.*	12, 123
Kujitekra, Ass.	Carallia integerrima, *DC.*	32
Kulai, Kan.	Gmelina arborea, *Roxb.*	52
Kule ,,	Lagerstromia lanceolata, *Wall.*	64
Kule Kumri, Kan	Gmelina arborea, *Roxb.*	52
Kuli, Kan		
Kumba, C. P	Holoptelea integrifolia, *Planch*	57
Kumbalam, Tam.	Gmelina arborea, *Roxb*	52
Kumbh Hind.	Careya arborea, *Roxb*	34, 116
Kumbi Hind. Tam, Tel.		
Kumbili, Kan.	Gmelina arborea, *Roxb.*	52
Kumela, Tam		
Kumhar, Hind.		
Kumhi, Hind.	Careya arborea, *Roxb*	34, 116
Kumia, Beng.	Barringtonia acutangula, *Gærtn.*	23
Kumilamaram, Tel.	Gmelina arborea, *Roxb*	52
Kummi, Tam.		
Kumdrikam, Tam.	Boswellia serrata, *Roxb*	29, 138
Kungli, Tam.		
Kunja, C. P.	Holoptlea intigrifolia, *Planch*	57
Kura, Hind. Bombay	Holarrhena antidysenterica, *Wall*	57, 117, 144
Kurimutal, Kan.	Ougeinia dalbergioides, *Benth.*	71, 115
Kurpa, Tel.	Barringtonia acutangula, *Gærtn.*	23
Kusam, Hind.	Schleichera trijuga, *Willd*	92, 126
Kut, Kashmere	Saussurea Lappa, *Clarke*	143
Kyeni, Burm.	Barringtonia acutangula, *Gærtn.*	23
Kyi ,,		
Kyein-byu, Burm.	Calamus spp.	150, 151
Kyein-ga, Burm.	,, viminalis, *Willd.*	150, 151
Kyeing-ni ,,	,, Guruba, *Ham*	150, 151
Kyein-kha ,,	,, viminalis, *Willd.*	150, 151
,, -ni ,,	,, Guruba, *Ham*	150, 151
Kyet-u, Burm	,, viminalis, *Willd.*	150, 151
Kyinga ,,	,, spp.	150, 151

L

Laburnam, Indian	Cassia Fistula, *Linn.*	34, 131, 147
Lac		152
Lakuch, Hind.	Artocarpus Lakoocha, *Roxb.*	23
Laku-chamma Tel.		
Lal chundan, Tam.	Pterocarpus santalinus, *Linn. f.*	97
Lal chandan, Bombay.	Soymida febrifuga, *Adr. Juss.*	86
Lemon grass	Cymbopogon citratus *DC.*	120, 121
Lendya, Hind	Lagerstromia parviflora, *Roxb.*	65
Letpan, Burm.	Bombax malabaricum, *DC.*	28, 115, 117, 128
Lettokkyi, Burm.	Holarrhena antidysenterica, *Wall.*	57, 117, 144
Lettokthein, Burm.		
Lim, Hind	Cedrela Toona, *Roxb.*	37
Limbo, C P	Melia indica, *Brandis.*	67
Liquor, Mohwa		124
Loharbhadi Beng.	Odina Wodier, *Roxb.*	70, 116, 132, 137
Long-needled pine	Pinus longifolia, *Roxb*	77, 136, 139
Lowi Hind	Artocarpus Lakoocha, *Roxb.*	23
Luban, Beng	Boswellia serrata, *Roxb*	29
Lud, Beng	Cedrela Toona, *Roxb.*	37
Lust, U P	Taxus baccata, *Linn.*	99

M

Maa, Tam	Mangifera indica, *Linn*	66, 147
Macassar hair oil		126
Madagari vembu, Tel, Tam	Cedrela Toona, *Roxb*	37, 135
Madar Hind	Erythrina suberosa, *Roxb*	50
Maddi, Tel.	Terminalia tomentosa, *W. & A.*	104
Madi, Kan.	Boswellia serrata, *Roxb*	29
Maddidhupa, Kan.	Vateria indica, *Linn.*	107
Maduga, Tam	Erythrina suberosa, *Roxb.*	50
Magadam, Tam	Mimusops Elengi, *Linn*	69
Maha nim, Hind.	Cedrela Toona, *Roxb*	37, 135
Mahila, Tam.	Mimusops Elengi, *Linn.*	69
Mahogany, East India.	Soymida febrifuga, *Adr. Juss.*	97
Mahua, Hind.	Bassia latifolia, *Roxb.*	24, 124, 125
Mahula, Beng.		
Mahwa, Hind Beng.		
Makad bhirand, Kan.	Carallia integerrima, *DC.*	32
Makil, Tam	Mimusops Elengi, *Linn.*	69
Malabar oil		121
Malachithiyan, Tam	Bischofia javanica, *Blume.*	25
Malainangal, Tam	Mesua ferrea, *Linn*	68
Malai naval Tam.		
Malampunna, Tam	Calophyllum tomentosum, *Wight.*	31
Mál kanguni, Hind. Bombay	Celastrus paniculata, *Willd.*	127
Mamadi, Tel	Mangifera indica, *Linn.*	66, 147
Mamid, Tel.		
Manganese		155
Mangas, Tam.	Mangifera indica, *Linn.*	66, 147
Mango		147
Mangosteen	Garcinia Mangostana, *Linn.*	148
Mangrove	Rhizophora spp.	132
,, *white*	Avicennia officinalis, *Linn*	132
Maniawga, Burm	Carallia integerrima, *DC.*	32
Mara, Kan.	Mangifera indica, *Linn*	66, 147
Marble-wood, Andaman	Diospyros Kurzii, *Hiern.*	47
Mari, Tel.	Ficus bengalensis, *Linn.*	51, 115
Marking-nut tree	Semecarpus Anacardium, *Linn. f.*	128, 147
Mashwal, Kan.	Chloroxylon Swietenia, DC.	41
Mathi, Tam.	Terminalia tomentosa, *W. & A.*	104, 132
Matti, Kan.		
Maul, Beng.	Bassia latifolia, *Roxb*	24, 124, 125
Maulsari, Hind.	Mimusops Elengi, *Linn.*	69
Maulser Hind.		
Mavina Hind.	Mangifera indica, *Linn.*	66, 147
May, Tel.	Schleicheta trijuga, *Willd*	92, 126
Mechi, Ass.	Lagerstromia parviflora, *Roxb.*	65
Methogiri-vembu, Tam.	Bischofia javanica, *Blume*	25
Mica	... ..	155
Milachittyan, Tam.	Bischofia javanica, *Blume.*	25
Milachandeyen ,,		
Mineral products	.....	155
Moduga, Tel.	Butea frondosa, *Roxb.*	30, 115, 135, 137

PAGE.

Mohi, Hind. . } Odina Wodier, *Roxb.* 70, 116, 132, 137
Mohin, Hind. .
Mohtu, Tel . Butea, frondosa, *Roxb.* 30
Mohwa, Mar. . Bassia latifolia, *Roxb.* 24
Moina, Bombay Odina Wodier, *Roxb* 70, 116, 132, 137
Morada, Tam. . Boswellia serrata, *Roxb* . . 29
Morında, Jaunsar . Abies Pindrow, *Spach.* 9
Moringa gum . . 137
Moru, U. P. . Quercus dilatata, *Lindl* . 87,
Motia oil . 121
Moulmein cedar . Cedrela Toona, *Roxb.* 37, 135
Mowa, Hind. . Bassia latifolia, *Roxb.* . 24, 124, 125
Mowen „ . Odina Wodier, *Roxb.* 70, 116, 132, 137
Mowra *liquor* . . 124
Moyen, Hind. } Odina Wodier, *Roxb.* 70, 116, 132, 137
Moyna „ .
Mugali, Kan. . } Mimusops Elengi, *Linn* . 69
Mukalai, Tam. .
Mul ilavam, Tam . Bombax malabaricum, *DC.* . 28
Mulkottam, „ . Schleichera trijuga, *Willd.* . . 92
Mulsari, Hind. . Mimusops Elengi *Linn* 69
Mulu, Tel Erythrina suberosa, *Roxb* 50
Munda dhup, Kan. Vateria indica, *Linn* 107, 128, 136, 138
Muni, Tam . Erythrina suberosa, *Roxb* . 50
Munj grass . Saccharum arundinaceum, *Retz* 117
Murri, Tel. Ficus bengalensis, *Linn* 51, 115
Mutirai, Tam. . Chloroxylon Swietenia, *DC* . 41
Muttala, Kan . Butea frondosa, *Roxb.* 30, 115, 135, 137
Mutti, Kan . Terminalia tomentosa, *W. & A* 104, 132
Muttugal Kan. Butea frondosa, *Roxb* 30, 115, 135, 137
Myaukchaw, Burm. Homalium tomentosum, *Benth* 58
Myauklaung, U. Burm. } Artocarpus Lakoocha, *Roxb* . 23
Myauklôk, Burm. .
Myaukseik „ . Holoptelea integrifolia, *Planch.* . 57
Myrabolams . 133
„ *Beleric* ... 134
„ *Chebulic* . . 133
„ *Emblic* .. 134

N

Nabe, Burm. . . Odina Wodier, *Roxb* 70, 116, 132, 137
Naga, Tam. . Eugenia Jambolana, *Lam* . 50
Naga kesara, Tel. . Mesua ferrea, *Linn.* . . 68
Nagapalam, Tam . Eugenia Jambolana, *Lam* . 50
Naga-sampige, Kan. Mesua ferrea, *Linn* . 68
Nageaydu, Tel. . Eugenia Jambolana, *Lam.* 50
Nagesar, Beng. } Mesua ferrea, *Linn.* . . 68
Nahor, Ass
Naikadabe, Kan. . Stephegyne parvifolia, *Korth* . . 98
Nairul, Kan . } Eugenia Jambolana, *Lam.* . . 50
Nairuri, Tel. .
Naka, Tam. . Mesua ferrea, *Linn* . . 68
Nakka-renu, Tel. . Artocarpus Lakoocha, *Roxb.* . . 23
Nali, C. P., „ . Holoptelea integrifolia, *Planch.* . 57
Nalla maddi, Tel. Terminalia tomentosa, *W. & A* 104, 132
Nalla sandra „ . Acacia Catechu, *Willd* . 12 123
Nallati, Tel. . Diospyros Ebenum, *Kœnig.* . . 46
Namai, Tam. . Anogeissus latifolia, *Wall.* . 16
Namli, Tel. . Holoptelea integrifolia, *Planch.* . 57
Namme, Tam. . . Anogeissus latifolia, *Wall.* . . 16
Nana, Mar. . } Lagerstrœmia lanceolata, *Wall.* . 64
Nandi, Kan. .
Nanodu, Tel. . Eugenia Jambolana, *Linn.* . 50
Nangal, Tam. . } Mesua ferrea, *Linn.* . . . 68
Nangu „ .
Narala, Kan. . Eugenia Jambolana, *Linn.* . 50
Narayepi, Tel. . Hardwickia binata, *Roxb.* . 54, 114
Naredu, Tel. . Eugenia Jambolana, *Linn.* . 50
Narepi, Tel. . Hardwickia binata, *Roxb.* . 54, 114
Nareyr, „ . } Eugenia Jambolana, *Linn.* . 50
Nasedu, „ .
Nasut, Hind. . Erythrina suberosa, *Roxb.* . . 50
Navili, Tel. . Holoptelea integrifolia, *Planch.* . 57
Navvel, Tam. . } Eugenia Jambolana, *Lam* . . 50
Nawar „ .
Neeli, Kan. . Bischofia javanica, *Blume.* . . 25
Neem, Hind. . Melia indica, *Brandis* . . . 67
Nelagumadi, Tel. . Gmelina arborea, *Roxb.* . . . 52
Nella-madu „ . Terminalia tomentosa, *W. & A.* 104, 132
Nella tuma, „ . Acacia arabica, *Willd.* . 11, 129, 134

PAGE.

Nemali, Tel. . . Holoptelea integrifolia, *Planch.* . 57
Neora, Hind . . Barringtonia acutangula, *Gærtn.* . 23
Nepal aconite . . 143
Neral, Kan. . } Eugenia Jambolana, *Lam.* . . 50
Nerdi, Tel. .
Nerlu, Kan. .
Netra „ . . Pterocarpus Marsupium, *Roxb.* 84, 137
Ngu, Burm. . } Cassia Fistula, *Linn.* . 34, 131, 147
Ngugyi, Burm. .
Nili, Kan . . Bischofia javanica, *Blume* . . 25
Nim, Hind. . . Melia indica, *Brandis*, . 67
Nirakadambi, Tam . Stephegyne parvifolia, *Korth.* . . 98
Nirdaddal, Kan. . Barringtonia acutangula, *Gærtn.* 23
Nir kadambe, Tel., Tam } Stephegyne parvifolia, *Korth.* 98
Nir kadampa, Tam
Nirole, Kan. Eugenia Jambolana, *Lam.* . . 50
Nugallu, Kan Bischofia javanica, *Blume.* . . 25

O

Oak, Ban. . Quercus incana, *Roxb* . . . 88
„ *Moru* „ dilatata, *Lindl.* . . . 87
Odi, Tam . } Odina Wodier, *Roxb.* 70, 116, 132, 137
Odia „ .
Oil, Agar-agar . .. 122
„ *Cassia* . . . 144
„ *Cinnamon* . . 124
Cochin 121
„ *Deodar tar.* . .. 122
„ *grasses* . . . 120
„ *Gurjan* 140
„ *In* . 140
„ *Lemon grass* . . 121
„ *Malabar* . 121
„ *Sandalwood* .. 122
„ *Walnut* 128
Oil-seeds 125
Oil, teak tar . . . 122
Oils, Grass . . 120
„ *Perfumed* . . 120
„ *Wood* . 122
Olagamaram, Tam . Bombax malabaricum, *DC.* . 28, 115, 117, 128
Oleo-resins . 140
Oodlu, Kan. Bassia latifolia *Roxb* . 24, 124, 125
Ornatto dye . . 135
Othalei, Tam . . Acacia Catechu, *Willd.* . . 12, 123

P

Pachaganapa, Tel. Adina cordifolia, *Hook f.* . . 13
Padauk, Burm. (*Andaman*). Pterocarpus dalbergioides, *Roxb.* . 81
Padauk, Burm. (*Burma*) „ macrocarpus, *Kurz.* . 82
Pagada, Tel. } Mimusops Elengi, *Linn.* . . 69
Pagade, Kan.
Pagun, Hind, Beng Bombax malabaricum, *DC.* . 28, 115, 117, 128
Paini, Kan. . . Vateria indica, *Lam* 107, 128, 136, 138
Pala, Tam, Tel. Holarrhena antidysenterica, *Wall.* . 57
Palas, Hind, Beng. . } Butea frondosa, *Roxb.* 30, 115, 135, 137
Palavai, Tam. . .
Palm leaves 155
„ *Palmyra* . . Borassus flabellifer, *Linn.* . . 113
„ *Sago* . . Caryota urens, *Linn.* . . . 112
„ *Talipot* . . Corypha umbraculifera, *Linn.* . . 155
„ *Wild date* . Phœnix sylvestris, *Roxb.* . . 113
Pangara, Hind. . } Erythrina suberosa, *Roxb.* . . 50
Pangra „ . .
Panjira „ . .
Paukain „ . Bischofia javanica, *Blume.* . . 25
Papar, Hind. . } Holoptelea integrifolia, *Planch.* . 57
Papri „ . .
Parangi, Tel. . . Boswellia serrata, *Roxb.* . 29, 138
Para rubber . . . 141
Parasu, Tam. . . Butea frondosa, *Roxb* 30, 115, 135, 137
Parutti, Tam. . . Bombax malabaricum, *DC.* . 28, 115, 117, 128

		PAGE.
Paspu, Tel.	Adina cordifolia, *Hook. f*	13
Pathi, Ass.	Licuala peltata, *Roxb.*	155
Pauk, Burm.	Butea frondosa, *Roxb.*	30, 115, 135, 138
Pava, Tam	Schleichera trijuga, *Willd*	92, 126
Peddi-mari, Tel.	Ficus bengalensis, *Linn*	51
Pedaga, Tel	Pterocarpus Marsupium, *Roxb.*	84, 115
Pedei ,,		
Peinné, Burm.	Artocarpus integrifolia, *Linn f.*	22, 147
Pekadukkai, Tam.	Lagerstromia parviflora, *Roxb*	65
Pe-karakai ,,	Terminalia paniculata, *W. & A*	103
Pelah, Tam	Artocarpus integrifolia, *Linn. f*	22
Pepper		146
,, *Long*	Piper longum, *Linn*	146
Perukadappay, Tam.	Barringtonia acutangula, *Gærtn*	23
Petpuria, Beng.	Adina cordifolia, *Hook f*	13
Pettega, Kan.		
Phalani, Hind.	Eugenia Jambolana, *Linn*	50
Phalinda ,,		
Phalsa ,,	Grewia tiliæfolia, *Vahl*	53
Pharenda, Hind.	Eugenia Jambolana, *Linn*	50
Pharsa, Hind	Grewia tiliæfolia, *Vahl*	53
Phaunda ,,	Eugenia Jambolana, *Linn*	50
Piasal, Hind.	Pterocarpus Marsupium, *Roxb*	84
,, Beng.	Terminalia tomentosa, *W & A.*	104, 132
Pilla, Tam	Artocarpus integrifolia, *Linn f.*	22, 147
Pillaimarudu, Tam.	Terminalia paniculata, *W & A*	103
Pine, Blue	Pinus excelsa, *Wall*	75, 136, 139
Pine, Long-needled	Pinus longifolia, *Roxb.*	77, 136, 139
Pinekai, Kan.	Calophyllum Inophyllum, *Linn*	31
Pine-resins		139
,, *tar*		122
Piney maram, Tam	Vateria indica, *Linn.*	107, 128, 136, 138
Piney resin		138
,, *tallow*		128
,, *tree*	Vateria indica, *Linn*	107, 128, 136, 138
Pinle-kalwe, Burm.	Casuarina equisetifolia, *Forst*	36
Pinlekanazo ,,	Heritiera minor, *Lam*	56
Pinnai, Kan	Calophyllum Inophyllum, *Linn.*	31
Pinnay, Tam.		
Plantain fibre	Musa spp	113
Podophyllum		142
Pogada, Tel	Mimusops Elengi, *Linn*	69
Pogaung-sa, Burm.	Bischofia javanica, *Blume.*	25
Pokka, Kan.	Bassia latifolia, *Roxb*	24, 124, 125
Poma, Ass.	Cedrela Toona, *Roxb*	37
Pongimaram, Tam	Bombax malabaricum, *DC*	28, 115, 117, 128
Ponachettu, Tel.	Calophyllum Inophyllum, *Linn*	31
Pongu, Tam.	,, tomentosum, *Wight.*	31
Ponna, Tel	,, Inophyllum, *Linn.*	31
Ponnai maranki, Tam	Albizzia odoratissima, *Benth*	16
Ponnyet, *Burm.*	Calophyllum Inophyllum, *Linn.*	31
Poo, Tam.	Schleichera trijuga, *Willd*	92, 126
Poolamaram, Tam.	Careya arborea, *Roxb.*	34, 116
Poolah, Tam.	Schleichera trijuga, *Willd.*	92, 126
Poomardu, Tam.	Terminalia paniculata, *W & A*	103
Poon, Mal.	Calophyllum tomentosum, *Wight*	31
Poon-spar tree		
Poone, Kan, Tel		
Poongu, Tam.		
Poota tammi ,,	Careya arborea, *Roxb*	34, 116
Porasan, Tam.	Butea frondosa, *Roxb*	30, 115, 135, 137
Porasu ,,	Chloroxylon Swietenia, *DC*	41
Products, Animal		152
,, *Edible*	...	147
,, *Mineral*		155
Pu, Tam.	Schleichera trijuga, *Willd*	92, 126
Pula, Tam.	Bombax malabaricum, *DC*	28, 115, 117, 128
Pulachi, Tam.	Schleichera trijuga, *Willd*	92, 126
Pulagudem, Tel.	Stephegyne parvifolia, *Korth*	98
Pulibagi, Kan.	Albizzia odoratissima, *Benth*	16
Pulsaram, Tel	Schleichera trijuga, *Willd.*	92, 126
,, rajoti, Tel.		
Puluvai, Tam.	Terminalia paniculata, *W. & A.*	103
Pumarath ,,	Lagerstromia Flos-Reginæ, *Retz.*	62
Puna, Tel.	Calophyllum Inophyllum, *Linn.*	31
Punas ,,	Odina Wodier, *Roxb.*	70
Punnai, Tam.	Calophyllum Inophyllum, *Linn.*	31
Puroha, C. P.	Butea frondosa, *Roxb.*	30
Purush, Tam.	Chloroxylon Swietenia, *DC.*	41
Pusku, Tel.	Schleichera trijuga, *Willd.*	92, 126
Puth, Beng.	Calamus latifolius, *Roxb.*	150, 151
Puvam, Tam.	Schleichera trijuga, *Willd.*	92, 126
Puvandi ,,		
Puvu, Tam.		
Pwenyet dammer		139
Pyaukseik, Burm.	Holoptelea integrifolia, *Planch.*	57
Pyin, U Burm.	Xylia dolabriformis, *Benth.*	107
Pyinkado, Burm.		
Pyinma, Burm.	Lagerstromia Flos-Reginæ, *Retz.*	62
Pyinyaung, Burm.	Ficus bengalensis, *Linn.*	51, 115

Q

Quinine		144

R

Rai, Jaunsar	Picea Morinda, *Link*	74
Raila, C P	Cassia Fistula, *Linn*	34, 131, 147
Rain, Bombay	Soymida febrifuga, *Adr. Juss.*	97
Rajpores	Terminalia Chebula, *Retz* (Myrabolans)	133
Rakta chandan, Tam	Pterocarpus santalinus, *Linn f.*	86
Rama Kantha, Bombay	Acacia arabica, *Willd.*	11, 129, 134
Ramie fibre	Bœhmeria nivea, *Hook & Arn.*	115
Rampatri, Kan.	Myristica malabarica, *Lamk*	147
Ramphal, Nep.		
Ras-bija, Kan	Holoptelea integrifolia, *Planch.*	57
Rataganapa, Teel	Stephegyne parvifolia, *Korth*	98
Ravubija, Kan.	Holoptelea integrifolia, *Planch.*	57
Red Sanders	Pterocarpus santalinus, *Linn. f.*	86
Red-wood, Andaman	,, dalbergioides, *Roxb.*	81
,, *Indian*	Soymida febrifuga, *Adr. Juss*	97
Reeds		120
Rela, Tel	Cassia Fistula, *Linn.*	34, 131, 147
Rellu, Tel		
Renge, Kan.	Mimusops Elengi, *Linn.*	69
Resin, Piney		138
,, *Rock*	..	139
Resins		136
Resins from broad leaved species		136
Resins, Gum		136
Resins, Oleo		140
,, *other than pine resins*		139
Resins, Pine		139
Reylu, Tel.	Cassia Fistula, *Linn.*	34, 131, 147
Rhubarb	Rheum Emodi, *Wall*	144
Rimd, Andamans	Hopea odorata, *Roxb.*	59
Rinjal, C P	Shorea robusta, *Gærtn f.*	93
Ritha nuts	Sapindus emarginatus, *Vahl.*	146
Roatanga, Tel.	Schleichera trijuga, *Wild.*	92, 126
Roghu, Ass.	Adina cordifolia, *Hook. f*	13
Rohan, Hind, Bombay.	Soymida febrifuga, *Adr. Juss.*	97
Rohina, Beng.		
Root drugs		142
,, *dyes*		135
Roots, edible		147
Rosewood, Indian	Dalbergia latifolia, *Roxb.*	48
Rosha oil-grass	Cymbopogon Martini, *Stap. f.*	120
Rosin		139
,, *American*		139
,, *Indian*		139
Rowanra, Hind.	Erythrina suberosa, *Roxb.*	50
Rubber		141
,, *Castilloa*	....	141
,, *Ceara*	..	141
,, *Para*		141
Ruchhi, Beng.	Calamus latifolius, *Roxb.*	150, 151
Rudra gampa, Tel.	Adina cordifolia, *Hook. f.*	13
Rudraksha, Tel.	Stephegyne parvifolia, *Korth.*	98
Rungra, Hind.	Erythrina suberosa, *Roxb.*	50
Ryan, Guz.	Mimusops elengi, *Linn.*	69

S

		PAGE.
Sabai grass	Ischæmum angustifolium, *Hack*	117
Sadachi, Tam.	Grewia tiliæfolia, *Vahl*	53
Sadra, Berar	Terminalia tomentosa, *W & A.*	104, 132
Sag, Mar.	Tectona grandis, *Linn f*	100
Sagada, Kan.	Schleichera trijuga, *Willd.*	92, 126
Sagavan tega, Kan.	Tectona grandis, *Linn. f.*	100
Sagdi, Kan	Schleichera trijuga, *Willd.*	92
Sago, Bastard *,, Palm.*	Caryota urens, *Linn.*	112
,, ,,	Corypha umbraculifera, *Linn.*	155
Sagon, Hind Sagun ,, Saguvani, Kan. Sagwani ,,	Tectona grandis, *Linn. f.*	100
Sahm, Ass	Artocarpus Chaplsaha, *Roxb.*	21
Saigun, Hind	Tectona grandis, *Linn f.*	100
Sain, Hind. Saj ,,	Terminalia tomentosa, *W. & A.*	104, 132
Sakher, ,, Sakhu ,, Sal, Hind, Tel.	Shorea robusta, *Gærtn f.*	93, 128, 133
Sal butter	..	128
,, dammer		136
Sala, Hind.	Shorea robusta, *Gærtn f*	93, 128, 133
Salai, Hind, Beng. Salar, Hind	Boswellia serrata, *Roxb*	29
Sala-unjal, Tam.	Albizzia Lebbek, *Benth.*	14
Saler, Hind. Salga ,, Salhe ,,	Boswellia serrata, *Roxb.*	29
Saluva, Tel. Salwa, Hind.	Shorea robusta, *Gærtn. f.*	93, 128, 133
Sam, Ass	Artocarpus Chaplasha, *Roxb.*	21
Sambrani, Tam.	Boswellia serrata, *Roxb.*	29, 138
Samundar, Beng Samundar phul' Hind. Sanaffar, Hind	Barringtonia acutangula, *Gærtn.*	23
Sandal, Hind. *Sandal wood*	Santalum album, *Linn*	89
Sandan, Hind	Ougeinia dalbergioides, *Benth.*	71, 115
Sandana vengai, Tam.	Pterocarpus santalinus, *Linn f.*	86
Sandra, Tel.	Acacia Catechu, *Willd*	12, 123
Sannaippa, Tel.	Bassia latifolia, *Roxb.*	24, 124, 125
Sannan, Hind	Ougeinia dalbergioides, *Benth.*	71, 115
Santagu, Burm. Santhanam, Tam.	Santalum album, *Linn.*	89
Santhana vembu, Tam.	Cedrela Toona, *Roxb.*	37
Sara, Panjab	Saccharum procerum, *Roxb.*	118
Sarakonnai, Tam.	Cassia Fistula, *Linn*	34, 131, 147
Saraku, Tel.	Casuarina equisetifolia, *Forst*	36
Sarei, C. P.	Shorea robusta, *Gærtn. f.*	93, 128, 133
Sarsaparilla		144
Satin-wood	Chloroxylon Swietenia, *DC.*	41
Sauri, Kan. Sawar, Guz.	Bombax malabaricum, *DC.*	28
Screw pine	Pandanus spp.	111
Seed drugs		144
Seeds, Bamboo		148
,, Grass		148
,, Oil		125
Segapu chandanam, Tam.	Pterocarpus santalinus, *Linn f.*	86
Sein, Hind.	Terminalia tomentosa, *W. & A.*	104, 132
Seina ,, Seja ,,	Lagerstromia parviflora, *Roxb.*	65
Selai, Kan. Sela oonjai, Tam. ,, venjai ,, Seleyadamara, Kan.	Albizzia odoratissima, *Benth.*	16
Sem, Tam.	Soymida febrifuga, *Adr. Juss.*	97
Semul, Beng. *Semul, false*	Bombax insigne, *Wall.*	27
Semul, Hind., Beng. Semur ,, ,,	Bombax malabaricum, *DC.*	28, 115, 117, 128
Seniga, Tel.	Lagerströmia parviflora, *Roxb.*	65
Serva, Tel.	Casuarina equisetifolia, *Forst.*	36
Sewan, Hind	Gmelina arborea, *Roxb.*	52
Sha, Burm.	Acacia Catechu, *Willd.*	12, 123
Shal, Beng.	Shorea robusta, *Gærtn. f*	93, 128, 133
Shargadi, Kan	Schleichera trijuga, *Willd.*	92, 126
Sheakoy Madras	Acacia concinna, *DC.*	146
Shem, Tam	Soymida febrifuga, *Adr. Juss.*	97
Shembal, Hind., Beng.	Bombax malabaricum, *DC.*	28, 115, 117, 128
Shemmaram, Tam	Soymida febrifuga, *Adr. Juss.*	97
Shengutan, ,,	Diospyros Ebenum, *Kænig.*	46
Sheriman, Tel	Anogeissus latifolia, *Wall.*	16
Shewan, Hind Shewney, Kan.	Gmelina arborea, *Roxb.*	2
Shigakai ,,	Acacia concinna, *DC.*	146
Shimarra, U P.	Cassia Fistula, *Linn.*	34, 131, 147
Shimti, Kan	Odina Wodier, *Roxb.*	70, 116, 132, 137
Shinduga, Tel.	Albizzia odoatissima, *Benth.*	16
Shisham, Hind.	Dalbergia Sissoo, *Roxb.*	45
Shivani, Kan.	Gmelina arborea, *Roxb.*	52
Shombu, Tam	Soymida febrifuga, *Adr. Juss.*	97
Shrihonne, Kan.	Calophyllum tomentosum, *Wight.*	31
Sida, Hind , Beng.	Lagerströmia parviflora, *Roxb*	65
Silk cocoons		154
Silk tree	Bombax malabaricum, *DC.*	28, 115, 117, 128
Silver fir	Abies Pindrow, *Spach.* ,, Webbiana, *Lindl.*	9 9
Sim, U P	Cassia Fistula, *Linn.*	34, 131, 147
Simal, Hind Simul, Beng.	Bombax malabaricum, *DC.*	28, 115, 117, 128
Siiai, Hind.	Albizzia Lebbek, *Benth.*	14
Siran, Hind.	,, odoratissima, *Benth*	16
Siri, Kan	Calophyllum tomentosum, *Wight.*	31
Siri-karra, Tel	Anogeissus latifolia, *Wall.*	16
Sirikone, Tam	Cassia Fistula, *Linn.*	34, 131, 147
Sirin, Hind Siris ,,	Albizzia Lebbek, *Benth.*	14
Siris kala, Hind	,, odoratissima, *Benth.*	16
Sirisha, Beng.	,, Lebbek, *Benth*	14
Sirisi, Tel	,, odoratissima, *Benth*	16
Sirsa, Hind. Sirsul, Kan.	Albizzia Lebbek, *Benth.*	14
Siru-nagaypoo, Tam.	Mesua ferrea, *Linn.*	68
Sisal fibre		112
Sisali Kam.	Dalbergia latifolia, *Roxb.*	43
Sisam, Guz Sissai, Hind. Sissu, Tel , Hind.	,, Sissoo, *Roxb.*	45
Sissu, Guz.	Dalbergia latifolia, *Roxb*	43
Sithalavagai, Tam	Albizzia odoratissima, *Benth,*	16
Sital, Beng.	Dalbergia latifolia, *Roxb.*	43
Skins	..	154
Soap-nuts	...	146
Sofia oil	..	121
Solomanium, Tam	Albizzia odoratissima, *Benth.*	16
Somadanam, Tam. Somi, Tel , Kan Somida, Kan. Somidi, Tel	Soymida febrifuga, *Adr. Juss.*	97
Somr, Hind., Beng.	Bombax malabaricum, *DC.*	28, 115, 117, 128
Sonaru, Ass	Cassia Fistula, *Linn*	34, 131, 147
Sowkoo, Tam.	Casuarina equisetifolia, *Forst.*	36
Soymida, Tel	Soymida febrifuga, *Adr. Juss.*	97
Spear-grass	Andropogon contortus, *Linn.*	118
Spices		142, 144
Spruce, Himalayan	Picea Morinda, *Link.*	74
Srigandam, Tam., Tel.	Santalum album, *Linn.*	89
Srikonnai, Tam.	Calophyllum tomentosum, *Wight.*	31
Stem drugs	...	144
Stones	..	155
Suaini, Kan.	Soymida febrifuga, *Adr. Juss.*	97
Suket, Guz.	Santalum album, *Linn*	89
Sultana champa, Hind., Beng.	Calophyllum Inophyllum, *Linn.*	31
Sumbi, Kan. Somi, Tel.	Soymida febrifuga, *Adr Juss.*	97
Sunari, Beng. *,, bark*	Cassia Fistula, *Linn.*	34, 131, 147
Sunaru, Ass. Sundali, Beng.	Cassia Fistula, *Linn.*	34, 131, 147

PAGE.

Sunder, Beng.
Sundri ,, Heritiera minor, *Roxb.* 56
Surgé flowers 135
Surhoni, Kan. Calophyllum tomentosum, *Wight* 31
Surli, Tam. Mesua ferrea, *Linn* 68
Sur reeds Phragmites spp. 120
Surugu, Tel. Casuarina equisetifolia, *Forst* 36
Suvarnam, Tel Cassia Fistula, *Linn.* 34, 131, 147
Swami mara, Kan. Soymida febrifuga, *Adr. Juss.* 97

T

Tabasi, Kan. Holoptelea integrifolia, *Planch.* 57
Tadasala, Kan.
Tadda, Tel. Grewia tiliæfolia, *Vahl.* 53
Taddasu, Kan
Tagumuda, Tel. Gmelina arborea, *Roxb* 52
Tai, Tam Diospyros Ebenum, *Kœnig.* 46
Tairsi, Tel. Holoptelea integrifolia, *Planch.* 57
Tallow tree, Chinese Sapium sebiferum, *Roxb* 128
,, ,, Piney. Vateria indica, *Linn* 107, 128, 136, 138
Tamaka, Burm. Melia indica, *Brandis* 67
Taman, Mar. Lagerströmia Flos Reginæ 62
Tambra Nagesar 135
Tamrug, Guz. Diospyros Melanoxylon, *Roxb.* 47
Tan barks 129
,, fruits ... 132
,, leaves 132
Tans. 129
Tanach, Guz. Dalbergia Sissoo, *Roxb.* 45
Tangedu, Tel. Xylia dolabriformis, *Benth* 107
Tantia, Hind. Albizzia Lebbek, *Benth* 14
Tapasi, Kan., Tam., and Tel. Holoptelea integrifolia, *Planch.* 57
Tapsi, Kan., Tel.
Tar, Chir 122
,, Kail 122
,, Teak 122
Tar oil, Deodar 122
,, ,, teak 122
Tara, Kan Acacia Catechu, *Willd* 12, 123
Taruka, Tel Melia indica, *Brandis* 67
Tarwar, Hind. Cassia auriculata, *Linn* 131
Taukkyan, Burm. Terminalia tomentosa, *W. & A.* 104, 132
Taungpeinne, Burm Artocarpus Chaplasha, *Roxb* 21
Tavisi, Kan Holoptelea integrifolia, *Planch.* 57
Tawdama, U. Burm. Cedrela Toona, *Roxb* 37, 135
Teak Tectona grandis, *Linn.* 100
,, tar 122
Teakah, *Burm* Diospyros Kurzii, *Hiern.* 47
Tega, Kan.
Tegina, Kan. Tectona grandis, *Linn f.* 100
Tegu, Kan
Tein, Burm.
Teinthe, Burm. Stephegyne parvifolia, *Korth.* 98
Tek, Tam
Tekan, Kan.
Tekku, Tam. Tectona grandis, *Linn. f.* 100
Teku, Tel
Tella motku, Tel. Ougeinia dalbergioides, *Benth* 71, 115
Tella tuma, Tel. Acacia Catechu, *Willd* 12, 123
Telsu, Tel. Albizzia odoratissima, *Benth.* 16
Tembru, Bombay
Tendu, Hind Diospyros Melanoxylon, *Roxb.* 47
,, ,, ,, Ebenum, *Kœnig* 46
Tetura, Beng. Albizzia odoratissima, *Benth* 16
Tewas, Mar. Ougeinia dalbergioides, *Benth.* 71, 115
Thabye, Burm.
Thabyebyu, Burm. Eugenia Jambolana, *Lam.* 50
Thadas, Kan.
Thadasal, Tam.
Thadasil ,,
Thadasu ,, Grewia tiliæfolia, *Vahl.* 53, 115, 147
Thadda, Tel.
Thadsal, Kan.
Thaing, Burm. Calamus erectus, *Roxb.* 150
Thana, Tel.
Tharra, Tel. Grewia tiliæfolia, *Vahl.* 53, 115, 147
Thayet, Burm. Mangifera indica, *Linn.* 66
Thedachi, Tam. Grewia tiliæfolia, *Vahl.* 53, 115, 147

PAGE.

Thevatharam, Tam. Cedrela Toona, *Roxb.* 37, 135
Thinbaw-tamaka, Burm Melia indica, *Brandis.* 67
Thingan, Burm. Hopea odorata, *Roxb* 59
Thitkado, Burm Cedrela Toona, *Roxb* 37, 135
Thitkya, Burm Diospyros Kurzii, *Hiern.* 47
Thitmagyi, Burm. Albizzia odoratissima, *Benth.* 16
Thitmin, Burm
Thitminpo, Burm. Podocarpus neriifolia, *Don.* 79
Thitpyu, U Burm Albizzia odoratissima, *Benth* 16
Thitsi, Burm Melanorrhœa usitata, *Wall.* 140
,, *oil* 140
,, *varnish* 141
Thodagatti, Kan. Dalbergia latifolia, *Roxb* 43
Thondi, Tam Bischofia javanica, *Blume.* 25
Thoras, Kan Butea frondosa, *Roxb* 30, 115, 135, 137
Thothagatti, Tam. Dalbergia latifolia, *Roxb* 43
Thula, Beng Bombax insigne, *Wall* 27
Thumbri, Kan. Diospyros Melanoxylon, *Roxb.* 47
Thunner, U P Taxus baccata, *Linn.* 99
Tilanga, U P Quercus dilatata, *Lindl.* 87
Tiliya-gurjan, Beng Dipterocarpus turbinatus, *Gærtn f.* 49
Timmurri, Tel. Diospyros Melanoxylon, *Roxb* 47
Timsha, U P Quercus dilatata, *Lindl* 87
Tinnas, Hind.
Tinsa ,, Ougeinia dalbergioides, *Benth* 71, 115
Tinyu, Burma Casuarina equisetifolia, *Forst* 36
Taxus baccata, *Linn.* 99
Tirawa, Kan. Xylia dolabriformis, *Benth.* 107
Tirman, Tel Anogeissus latifolia, *Wall* 16
Tirpu, Kan Hopea parviflora, *Bedd* 60
Tirukontai, Tam. Cassia Fistula, *Linn.* 34, 131, 147
Tirupa, Kan Hopea parviflora, *Bedd.* 60
Tiruwa, Kan
Tirwa, Kan Xylia dolabriformis, *Benth.* 107
Todagatti, Tam. Dalbergia latifolia, *Roxb.* 43
Toon, Hind. Cedrela Toona, *Roxb.* 37, 135
Travancore Lemon grass-oil. 121
Tuki, Tel. Diospyros Ebenum, *Kœnig.* 46
,, Melanoxylon, *Roxb* 47
Tuma, Tel Acacia arabica, *Willd.* 11, 129, 134
Tumbi, Tam. Diospyros Ebenum, *Koenig* 46
Tumida, Tel. Diospyros Melanoxylon, *Roxb.* 47
Tumiki, Tel. Diospyros Ebenum, *Koenig* 46
Tumma, Tel. ,, Melanoxylon, *Roxb* 47
Tun, Hind, Beng. Tam. Acacia arabica, *Willd.* 11, 129, 134
Tundu, Kan.
Tuni, Hind, Beng Cedrela Toona, *Roxb* 37, 135
Tuniki, Tel Diospyros Melanoxylon, *Roxb* 47
Tunuj, Hind. Ougeinia dalbergioides, *Benth* 71, 115
Turmeric, Willd. Curcuma aromatica, *Salisb* 147
Turpentine 139
Tuti, Kan. Bombax malabaricum, *DC.* 28, 115, 117, 128

U

Udi, Tam.
Udia ,, Odina Wodier, *Roxb.* 70, 116, 132, 137
Ulvi, Kan. Terminalia paniculata, *W. & A.* 103
Unnu, Tam.
Unu ,, Grewia tiliæfolia, *Vahl.* 53, 115, 147
Uriam, Ass.
Uriana ,, Bischofia javanica, *Blume.* 25
Usan, Beng. Terminalia tomentosa, *W. & A.* 104, 132
Uthi, Tem Odina Wodier, *Roxb.* 70, 116, 132, 137

V

Vada maruthu, Tam. Terminalia paniculata, *W. & A* 103
Vaghe, Tam. Albizzia Lebbek, *Benth* 14
Vaimara, Tam. Chloroxylon Swietenia, *DC.* 41
Vallay, kungiliam, Tam. Vateria indica, *Linn* 107, 128, 136, 138
Valukkai, Tam. Grewia tiliæfolia, *Vahl.* 53
Vammarai, Tam. Chloroxylon Swietenia, *DC.* 41
Vari-bentik, Kan. Lagerströmia Flos-Reginæ, *Retz.* 63
Vegetable butter 128
Vekkali, Tam. Anogeissus latifolia, *Wall.* 16

PAGE.

Velayil, Tam. . . Holoptelea integrifolia, *Planch.* . 57
Vellaikongu, Tam. . Hopea parviflora, *Bedd* . . 60
Vellai kungiliyam, Tam. Boswellia serrata, *Roxb.* . 29, 138
Vellainagai, Tam. . } Anogeissus latifolia, *Wall* . 16
Vellainummai, Tam.. }
Vellei Kuntrikam, Tam. Vateria indica, *Linn* 107, 128, 136, 138
Velnagai, Tam. Anogeissus latifolia, *Wall.* . . 16
Veluturu, Tel. . Xylia dolabriformis, *Benth.* . . 107
Vembu, Tam. . } Melia indica, *Brandis* . . 67
Vempa, Tel. . }
Vengai, Tam. Pterocarpus Marsupium, *Roxb* . 84
Ven-maruthu, Tam.. Terminalia paniculata, *W. & A.* 103
Ventaku, Kan . Lagerströmia parviflora, *Roxb.* . 65
,, Tel. . } ,, lanceolata, *Wall.* 64
Venteak, Tam . }
Ventek, Tam }
Venteku, Tel , Tam. Lagerstromia lanceolata, *Wall.* . 64
Vepa, Tam , Tel Melia indica, *Brandis.* . 67
Vepala madarsagida, Kan. } Holarrhena antidysenterica, *Wall* 57, 117, 144
Vepali, Tam. . . }
Veypam, Tam. . Melia indica, *Brandis* . . 67
Vilva-pattiri, Tam . Mimusops elengi, *Linn* . 69
Vodolai, Tam. . Acacia Catechu, *Willd* . 12, 123
Vonte mara, Kan. Artocarpus Lakoocha, *Roxb.* . . 23

W

Wad, Mar. . Ficus bengalensis . . 51, 115
Walnut Juglans regia, *Linn* 61, 128, 147
,, *East India* Albizzia Lebbek, *Benth.* . . 14
Wara-gogu, Tel. . Lagerströmia Flos-Reginæ, *Retz* 62
Watchuli, Kan. . Artocarpus Lakoocha, *Roxb* 23
Wax . . . 153
White dammer. . 138
Wild cherry . Prunus Padus, *Linn* . . 148
,, *date palm* . Phœnix sylvestris, *Roxb* . 113
,, *turmeric* . . Curcuma aromatica, *Salisb.* 147
Wodier, Tam. . . Odina Wodier, *Roxb.* 70, 116, 132, 137
Wond, Tam. . . Soymida febrifuga, *Adr. Juss* . . 97
Wonta, Kan. . . Artocarpus Lakoocha, *Roxb* . . 23
Wood dyes . . . 134
,, *oils* . . 122
Woond-maram, Tam. Soymida febrifuga, *Adr Juss* . 97
Wude, Tam. Odina Wodier, *Roxb* . 70, 116, 132, 137
Wuma, Kan . Calophyllum Inophyllum, *Linn* . 31

Y

Yamane, Burm. . Gmelina arborea, *Roxb.* . . . 52
Yamata ,, Calamus latifolius, *Roxb* 150, 151
Yapa, Tel. . { Hardwickia binata, *Roxb.* . 54, 114
{ Melia indica, *Brandis* . . 67
Yeanga, Tel. . . } Pterocarpus Marsupium, *Roxb.* . 84
Yegi ,, . }
Ye-kyein, Burm. . Calamus grandis, *Kurz* . 151
Yellama, Tel. . Anogeissus latifolia, *Wall.* . . 16
Yemane, Burm. Gmelina arborea, *Roxb.* . 52
Yennimara, Kan. . Dipterocarpus turbinatus, *Gærtn. f.* 49
Yepa, Tel. . Melia indica, *Brandis* . 67
Yepi, Tel Hardwickia binata, *Roxb.* 54, 114
Yeppa, Tel . Bassia latifola, *Roxb* 24, 124, 125
Ye-pyinma, Burm. Lagerströmia Flos-Reginæ, *Retz* . 62
Yerjuchinta, Tel. Albizzia odoratissima, *Benth.* . 16
Yerra chandanam, Tel. Pterocarpus santalinus, *Linn f.* . 86
Yerugudu, Tel. . Dalbergia latifolia, *Roxb.* . . 43
Yetega, Kan. . . Stephegyne parvifolia, *Korth.*. . 98
Yethuga, Kan.. . } Adina cordifolia, *Hook. f.* . . 13
Yettada ,, }
Yew . . Taxux baccata, *Linn.* . . . 99
Yiryapa, Tel. . . Albizzia Lebbek, *Benth.* . . . 14

Z

Zaungbalè, U. Burm. Lagerströmia parviflora, *Roxb.* . 65
Zebra-wood, Andaman Diospyros Kurzii, *Hiern.* . . 47
Zolim-Buriki, Tam. . Schleichera trijuga, *Willd.* . 92, 126

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